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Issue 37 – March 2011

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ASIA PACIFIC FIRE MAGAZINE

REPORTING TO THE ASIA PACIFIC FIRE PROTECTION AND FIRE SERVICE INDUSTRY

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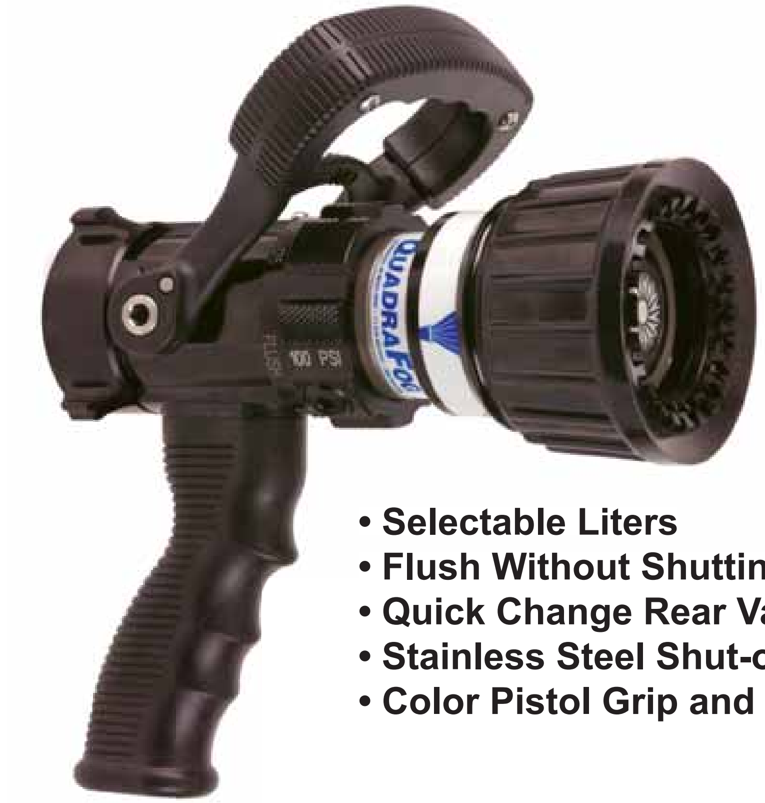

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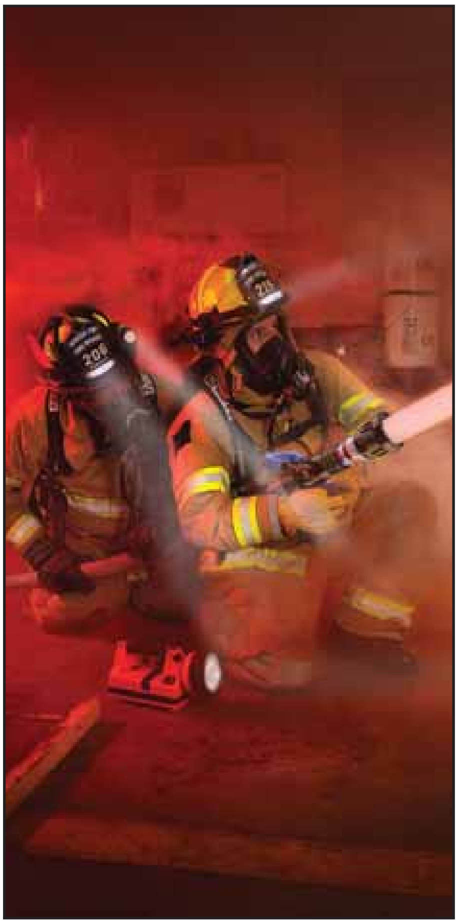

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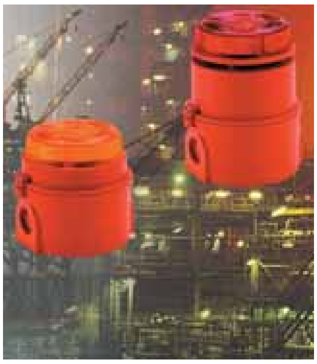
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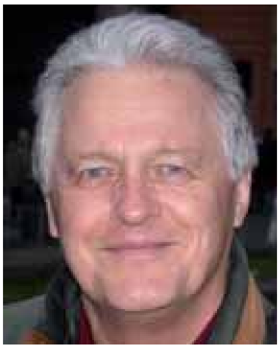

By Graham Collins

Teamwork!

Here they call it “helping your mates”

As this edition of Asia Pacific Fire went to press the tragic news was unfolding following the Christchurch earthquake in New Zealand. The New Zealand prime minister described it on television as: “probably the worst disaster in New Zealand’s history”. Significantly, this disaster and his commentary come only weeks after the premier of Queensland referred to the flooding as: “Australia’s worst ever natural disaster”.

It would not be at all surprising if the people in both countries did not feel as if they had been singled out for the worst that nature could throw at them, particularly if you recall that the Queensland floods were followed almost seamlessly by Cyclone Yasi. It is to their lasting credit that Australians and New Zealanders roll up their sleeves and set about rebuilding their broken homes and businesses. I have lived in Australia for just six months, and it has been humbling to experience this endurance and resolve first-hand.

Once again the emergency services in both countries have been stretched and tested, and once again they have shown that they rank among the best in the world. They have also been an example to the world that when adversity strikes on this scale, everyone works together. Within hours of these latest disasters, both countries did all they possibly could to help their neighbour. Academics would call this “teamwork” or “international cooperation” or “emergency relief”, but around here it is called more simply “helping your mates”.

So it is beholding to all of us in the fire and rescue fraternity – whatever that role might be – to do our very best to support those at the front line, whatever the emergency. The industry spends millions each year developing new technology to fight fires more effectively, to protect those putting their lives at risk in the emergency services, and to make rescue operations swifter and safer. On an equally important aspect of fire safety, architects and engineers too strive to design and construct safer and more resilient structures.

It is saddening therefore that opportunities to learn about these developments are not always grasped as eagerly and regularly as they might, whether it is being too busy to attend trade exhibitions, not getting involved in conferences or seminars, or not regularly reading relevant magazine articles. Not long ago, for example, I asked the principal of one of Europe’s leading fire engineering consultancies if he planned to attend a particular international exhibition (which, incidentally, was on his doorstep), only to get the reply that he: “no longer bothered with exhibitions”.

In all probability you or I would not go to a doctor who confessed to “not being bothered” to keep abreast of the latest developments – we would seek medical care elsewhere. Surely the same applies in our industry, as it is perfectly reasonable that we expect those responsible for making life-implicating recommendations and decisions about our fire safety to keep up to date with new techniques and technology.

But it does work both ways. Certainly those needing to know should take every opportunity to find out, but it is equally important that those of us with the information – manufacturers, specifiers, legislators, researchers and magazine publishers – put it into the hands of those that are going to use it to improve our safety. After all, we are one community and it is no more that helping our mates. APF

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Foreword

Working Together

There are certain times and special occasions that make us reflect both personally and professionally. Every year, usually in February or March, the president of the National Fire Protection Association convenes a meeting called "State of the Association", which brings together NFPA staff. During the event, the president reviews accomplishments of the previous years, highlights future goals, and recognises the years of commitment and loyalty of employees.

By Olga Caledonia

Executive Director
International
Operations, NFPA

I share this with you, because this year I am part of "15-year group" and would like to take this first 2011 issue of Asia Pacific Magazine to share this milestone. I have great respect and admiration for NFPA and I want to emphasise that this recognition of fifteen years is not only about my service; it is also about many of you, whose dedication to improve the levels of fire and life safety in your countries goes far beyond a monthly salary. While reminiscing on the contributions and achievements during this time, I am very optimistic for the future and opportunities ahead.

barriers when it comes to our obligation and duty to life safety. I am honoured to have the opportunity to serve as your direct link to NFPA and furthermore, regardless of the distance and time limitations, that you consider NFPA to be only a "phone call away".

I would also like to highlight the need to expand this group of advocates and ambassadors throughout Asia Pacific. If there is one subject I want leave you with it is an invitation; a special request to participate and join us in this effort. It seems like we often hear the same names at conference programs, constantly read technical articles with familiar names and even see the same people in event pictures as we browse through industry magazines. You can be one of these individuals.

The engine behind our globally recognised codes and standards are everyday individuals who volunteer their time in the development of these documents with the satisfaction of making a direct contribution to life safety.

At the NFPA we have a designation "Life Member"; an individual who has been a voting member of the Association continuously for 35 years. We also have a similar phenomenon with members of technical committees. The engine behind our globally recognised codes and standards are everyday individuals who volunteer their time in the development of these documents with the satisfaction of making a direct contribution to life safety.

Similarly, we often find individuals who do not actively participate in the Code Development Process, yet are "advocates" of NFPA codes and ultimately responsible for the implementation of legislation in their respective countries or regions. In Asia Pacific, many of these individuals are spokespersons and supporters of the Association.

Earlier this year I received a late night phone call and the first words I heard were: "Olga I apologise for the late night call but...." This call is a symbol of the career of service I have been blessed with. Time zones and different languages are no longer

Our teamwork in the region has been extraordinary. The increasing number of NFPA codes and standards translated into Chinese, Korean, Japanese and Thai is an inspiration, and the growing number of conferences and expositions is staggering. Recently established fire groups such as the Confederation of Fire Protection Associations – Asia, with which we work closely through its affiliation with the Confederation of Fire Protection Associations-International, is a great regional opportunity for volunteering. All of these achievements complement one another and leave us in a better position to meet new challenges.

At the end of day, we are all sharing the same objective: improving the levels of fire protection in Asia Pacific through the increased use of NFPA standards. APF

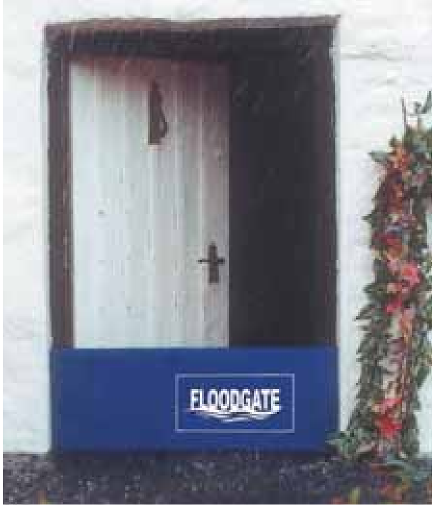
For further information, go to www.nfpa.org

Domestic Flood Protection

A domestic doorway flood protection barrier developed by FLOODGATE more than a decade ago is today available worldwide with annual sales of 2000 units.

The Floodgate barrier comprises a boxed tube metal frame that expands telescopically, firstly on the horizontal plane and then on the vertical. This frame locates in a 7mm thick rubber envelope that takes just minutes to install, and comes complete with all of the equipment necessary for successful installation.

A stanchion system allows a number of Floodgates to be connected together to form a continuous flood protection barrier for garages, patio doors and commercial properties. Ventguard, designed to protect vulnerable breathing points such as air bricks on exterior walls is also available.



For more information, go to www.floodgateaustralia.com

Thermal Imager That Offers so Much More

A new thermal imaging camera that is claimed to be much more than solely used for fire fighting has been introduced by FLIR SYSTEMS. The company says that it can also be used for support applications, scene assessment, incident investigation, search and rescue activities and firefighting prevention.

Depending on the configuration, the light and compact hand-held FLIR HF enables users to see objects over distances of between 400 metres and 1.2 kilometres, which is particularly useful when fighting large-scale industrial, wildfires or maritime fires and generally in search and rescue work. It requires no light to provide a crisp 320 pixel by 240 pixel image on which the smallest details can be seen without the need for adjustment. It also enables the firefighter to see through smoke and take temperature measurements.

Features include a spot temperature measurement meter that shows the temperature at the centre of the image. If this exceeds 150°C, the top part of temperature scale turns red, giving an instant indication that further steps need to be taken to extinguish the fire. The camera is fully controlled via just five buttons.

Four models are available, each with different performance features. The standard package comprises the camera, four rechargeable batteries, hot-shoe charging and video output attachment, car power adaptor, video output cable, AC charger, lanyard and manual.

For more information, go to www.flir.com.au

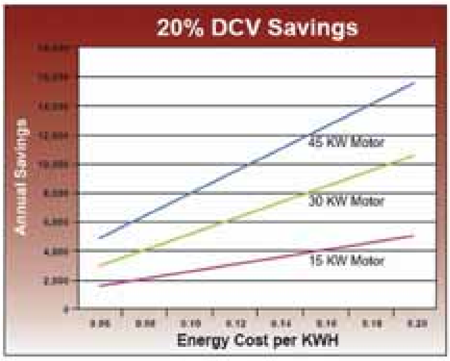
Smoke Alarm Wake-up Call for Children?

A study by Victoria University in Melbourne, Australia to determine the likelihood of school-aged children waking up to their home smoke alarm found that 78% of children slept through a smoke alarm sounding for 30 seconds.

Results of the study showed that, of the small number of children who did wake up, only half recognised the sound as a smoke alarm, and just half of those children knew they should evacuate. The data collected also showed that younger children – five to ten years old – were significantly more at risk, with 87% sleeping through the alarm, compared to 56% of 11 to 15 year olds.

While domestic smoke detectors have been relied on since the 1960s, and have been known to save lives in domestic fires, the study's results show children are most at risk. Dr. Dorothy Bruck, lead author of the study, said: "Parents should not rely on their children waking to the smoke alarm and should not assume that they will immediately evacuate if they do wake up to a fire." She continued: "This data suggests fire safety training needs more emphasis on the need for children to evacuate the home in the event of an alarm sounding."

On-demand Car Park Ventilation from XTRALIS



Demand controlled ventilation reduces energy costs

In most enclosed or underground car parks toxic gases from vehicle exhaust, such as carbon monoxide (CO) and nitrogen dioxide (NO_2), present a health risk to the general public and personnel. The risk of toxic gas poisoning in these enclosures is normally reduced or removed by natural or mechanical ventilation. While this approach is effective, the costs of continuous ventilation are very high.

Extending its Vesda aspirating smoke detection (ASD) technology, XTRALIS has introduced what it says is the industry's first system to combine ASD with gas detection and environmental monitoring. Vesda ECO uses an existing Vesda pipe network to actively sample air for the presence of smoke, as well as combustible or toxic gases or for oxygen deprived areas.

In car parks and loading bays, Vesda ECO can be used to continuously monitor toxic gases, such as CO and NO_2, to trigger demand controlled ventilation (DCV), so reducing energy cost. Many industries commonly use DCV, and engineers are well aware of the cost involved in running even medium-sized electric fans. For example, a single, 30 kW, 3 PH, 4-pole electric fan running 24 hours a day, seven days a week and at 16 cents for each kW/hr equates to an annual cost of $42,000.

Xtralis cites savings of $8,000 to $16,000 a year if Vesda ECO is used to trigger DCV, which saves 20 percent to 40 percent respectively, and reduced carbon emissions alone are a strong justification for using such gas detection equipment.

Field tests conducted in Australia in a Brisbane underground bus station and a Melbourne office building's loading bay have proved that Vesda ECO combined with Vesda ASD – when compared with conventional point (spot) type gas and smoke detectors – provides a holistic approach to detecting smoke and gases for the added protection of life, property and business continuity.

For more information, go to www.xtralis.com

Fire Hydrant Standard Published

STANDARDS NEW ZEALAND has published NZS 4522:2010 (Underground fire hydrants), a new Standard for underground fire hydrants that promotes the design, manufacture, supply and use of fire hydrants with consistent high performance, long life, and low maintenance requirements. It also provides installation guidance.

The new Standard covers screw-down and gate-valve underground fire hydrants and includes changes from the requirements set down in the previous Standard, NZS/BS 750:1984 (Specification for underground fire hydrants and surface box frames and covers), to reflect recent changes to hydrant manufacturing practices and technologies. The related Standard to NZS 4522:2010 is SNZ PAS 4509:2008 (New Zealand Fire Service firefighting water supplies code of practice).

The main function of fire hydrants is to provide an adequate firefighting water supply during fire emergencies, although they are also used for a wide range of operational purposes. Firefighting water supplies are specified in SNZ PAS 4509, and NZS 4522 specifies hydrant performance criteria that allows for the delivery of such water supplies through a screw-down hydrant with a standard hydrant standpipe fitted, and where the water reticulation system is operating at adequate minimum pressures and flows.

For more information, go to www.standards.co.nz

Compact and Portable Gas Detection

A new portable gas detector offering multi-gas detection of H2S, CO, Oxygen and combustibles, and designed to deliver low-cost, multi-gas solutions with one-button simplicity has been unveiled by BW TECHNOLOGIES BY HONEYWELL. GasAlertMicroClip XT is being promoted as being an attractive choice for a wide variety of applications, thanks to its range of additional functionality.

Features being highlighted include IP66/67 protection, IntelliFlash, which provides a visual indication of current operation to both the user and supervisor, together with "force bump test" and "force calibration" functionality that helps to ensure that it is always fully maintained and ready to detect gas. It has a simplified and tamper-proof single button operation and an intuitive interface to reduce training time. Its slim and compact design is said to make it easy and comfortable to wear.

GasAlertMicroClip XT is compatible with MicroDock II to provide a quick and simple solution to portable bump testing.

For more information, go to www.gasmonitors.com

New Range of Pacific Helmets

Pacific Helmets is introducing a remarkable range of new structural firefighting and rescue products this year. Among others, Pacific's newest helmet, the next-generation F10 structural firefighting helmet will be released to the market in mid-2011.

PACIFIC recently announced the imminent introduction of its newest helmet, the F10 (BFS) with internal 'bubble' face shield and optional One-Touch Eye Guard; the latest addition to the Pacific 'jet-style' helmet range. The F10 (BFS) is one of a host of new additions to the Pacific range, which is not only the most comprehensive range of safety helmets offered by any manufacturer, but also with certification to all global standards.

There has been a noticeable demand for a structural firefighting helmet that combines light weight and compact size with the highest levels of safety and comfort. The F10 (BFS) is the ideal lightweight solution for firefighting in confined spaces, with superior air circulation to enable heat dissipation, and minimising temperature build-up inside the helmet. The simplicity of the design allows for easy donning and doffing, while the One-Touch Eye Guard dramatically lessens the dexterity problems arising from wearing firefighting gloves. This attractive new design is a reflection of the fact that, as a leading safety helmet manufacturer, Pacific Helmets is particularly aware of firefighters' needs and concerns.

Building on its great success in the rescue category, Pacific is introducing the new R8 and Extractor helmets. The R8 is an innovative new multi-purpose helmet that is ideal for use by high performance industrial and technical/urban search and rescue personnel. The Extractor, a special edition water rescue helmet is a breakthrough product for Pacific. An ultra lightweight helmet that exhibits excellent buoyancy without the need for internally-mounted inflatable devices that may be punctured during operation. Both helmets will be certified to the relevant major international standards.

The new Quadsafe Elite/Supreme helmet will complement our current Quadsafe classic. They will allow added options for wearers, including the use of a combined mesh face shield-earmuff unit along with a Merino beanie for cold winter days. The new Quadsafe is compliant NZS 8600: 2002.

Why choose a Pacific Helmet?

- **30 years experience** in the design, manufacture and export of premium safety helmets to over 80 countries.
- **Assurance of Quality: ISO 9001** certification and all major international helmet standards (EN; NFPA; AS/NZS).
- **Customisation:** Pacific has the flexibility and capability to design, manufacture and decorate helmets to customers' specific requirements.
- **Longevity:** extended service life (up to 25 years is not uncommon); minimal operational cost; simple to maintain.
- **Lightweight and tough:** Kevlar composite shell technology enabling overall weight reduction and increased structural strength and toughness.
- **PPE Compatibility:** compatible with other PPE, notably a wide range of SCBA masks and communications technology.
- **After-sales Support:** comprehensive after-sales support including provision of replacement parts for an extended period after helmet purchase.

The good news is the F10 (BFS) is going into production now, and we expect to release the other new helmets progressively during second quarter of 2011. Specifications will vary according to the standard and customer preferences. APF

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For more information, go to www.pacifichelmets.com

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Lightweight Scott SCBA Carrying System

The Scott Safety Advanced Carrying System (ACSf & ACSfx) has been designed specifically to meet the changing needs of the professional fire services. Approved to AS/NZS 1716, the ACSf & ACSfx are refined to unequalled levels of performance and user comfort.

Scott Safety's ACSf & ACSfx is significantly lighter than any other carrying system in its class and is the first system in the world to incorporate ThermoFlex technology to create a unique sculptured soft back plate that provides the ultimate in comfort, ease of movement and contributes to reducing wearer fatigue. The ergonomically sculptured, soft back plate is designed and moulded to fit the spine and back muscles and was developed following intensive research with osteopaths, fabric and industrial technologists.

The harness incorporates high visibility reflected threading and has fully adjustable padded shoulder straps, a waistband featuring large buckles for easy operation with gloved hands in fast donning and removal, plus D Rings that allow fast and easy connection of other equipment to the webbing or straps. A rapid connect cylinder band allows for adjustment or change out of cylinder in seconds, which is beneficial in any fire operations.

The ACSfx combines all of the features of the ACSf, but also has an extending back plate that can be adapted to suit the height of the wearer.

Lower through-life costs

The ACS harness and cylinder band is manufactured from extremely durable 100% Kevlar flame retardant webbing with corrosion resistant nickel-plated components that are user serviceable, low cost and simple to maintain. All elements of the set are designed to allow for possible future upgrade with minimal cost.

Easy to keep clean, both the back plate and harness can be washed at the same time as the turnout gear, and the new hardwearing fabric material used in manufacturing is approved to maintain its flame retardant qualities for 50 washes at 90°C. A washing bag can be included to protect the harness and washing machine.

High performance pneumatics

At the heart of the ACS set is a simple, high performance and reliable two-stage pneumatic system. A first-breath-activated positive pressure demand valve provides low breathing resistance and excellent dynamic performance – particularly at high flow rates. A first stage pressure reducing valve features only two moving parts and accepts cylinder pressures up to 300 bar without adjustment.

No tools are necessary to remove the pneumatics as this can be achieved by simply rotating the pneumatics 90 degrees to disengage from the mounting.

The system includes a robustly designed shoulder-mounted pressure indicator with photo luminescent face markings for low-light legibility and a warning whistle with an operating pressure of 55 bar.

The design and manufacture of the back plate enables bespoke tailored sets to be made in a variety of colours and corporate branding to meet individual requirements. All sets are approved to international standards and there is wide choice of cylinders and facemasks including the Promask range.

With over one million firefighters worldwide trusting in the rugged dependability and cutting edge technology of Scott Breathing Apparatus, the new Advanced Carrying System (ACSf & ACSfx) is set to become the industry standard carrier for SCBA in the fire fighting industry. APF

For more information, go to
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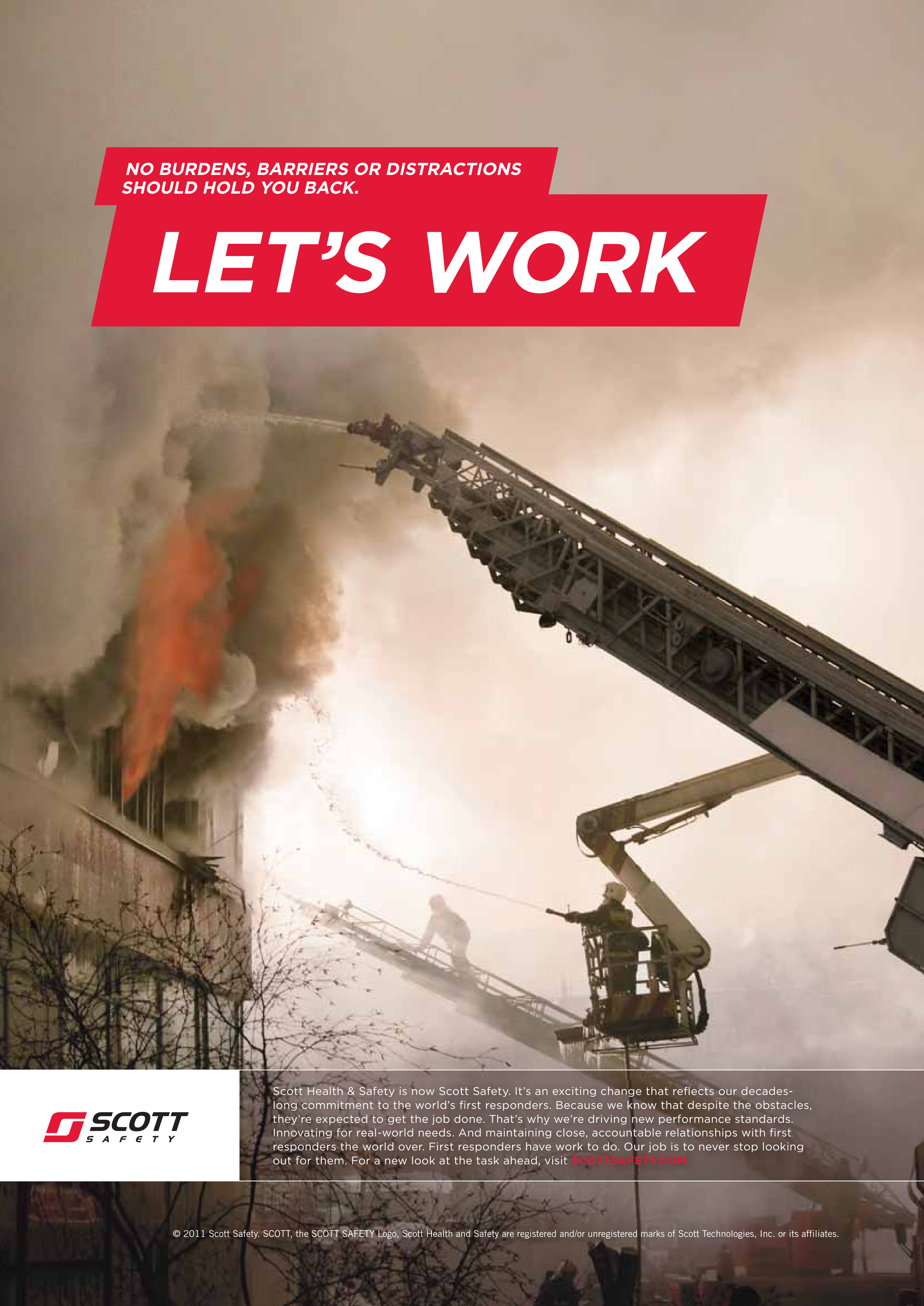
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Protection Tops Ten Million

Protective suit and systems manufacturer, BLÜCHER has announced that sales have topped the ten million mark in over 40 countries.

Based around the development and production of high-efficiency filter technologies and high-performance, highly porous absorbers, this structure produces an immensely large internal surface on which the substances – pollutants, smells and other unwanted substances – are reliably filtered out of gases and fluids and are safely deposited.

The latest Saratoga system is claimed to be the only one that covers all protection needs. Besides CBRN protection this includes protection against ballistics, foul weather, wind, overheating, fire and cold. Integral ventilation systems for cooling and moisture management and minimal weight reduce the physical strain and ensure adequate mobility.

As an example, the company cites its lightweight one-piece coverall that was specially developed for the use in hot and humid climates. This coverall utilises extremely light and thin materials, delivering a noticeable reduction in the physiological strain while wearing the suit.

The two-piece CBRN protective suit is specifically designed for the challenging operational conditions that are encountered in extreme temperature climates. The air-permeable Saratoga material is specially designed to minimise heat stress and maximise wear time and mission-capability, while still providing superior CBRN protection. The light colour of the suit also reduces the warming effect of solar radiation. The material is flame-retardant and a special inter-locking interface between the jacket and trousers prevents the penetration of sand and enhances protection against aerosols while preserving maximum operational flexibility and logistical efficiency.

For more information, go to www.blucher.com

Ash Addresses Fire and Gas Safety

An addressable smoke and heat (ASH) module – a single fire and gas safety system that monitors process areas and living quarters – has been introduced by DET-TRONICS. When combined with the Eagle Quantum Premier (EQP) safety system, it identifies the precise location of an alarming smoke or heat detector.

The company says that users no longer need to rely on an external fire panel to determine where a fire is occurring, as the ASH module enables smoke and heat detection in living quarters to be included in the same EQP system with flame and gas detection in hazardous process areas. All the information can be accessed now in one integrated EQP system that is Factory Mutual (FM) certified to the new NFPA 72-2010 standard.

Additional safety and ease-of-use features are cited as including: multiple smoke/heat detectors and devices on a single safety loop or spur; support for an array of devices, including horns, strobes, manual call stations, and input/output units; simple programming and logic; and enhanced functionality, such as integrated device level automatic integrity checking.

For more information, go to www.det-tronics.com

AS/NZS 5050-2010 Be-prepared Standard Published

AS/NZS 5050-2010 (Business continuity – Managing disruption-related risk) from STANDARDS AUSTRALIA is now available to assist organisations in Australia and New Zealand to maintain continuity in their business practices through the effective management of disruption-related risk.

The new Standard explains how to apply the principles, framework and process of risk management outlined in AS/NZS ISO 31000:2009 to disruption-related risks and business continuity. It also includes a methodology to determine how disruption can affect an organisation's business and the likelihood of these effects being experienced.

For more information, go to www.standards.org.au

Lighting the Way with New Design

HOLMATRO has introduced a new carrying handle design that incorporates four LED lights, doubling the light capacity for improved visibility.

The company was believed to be the first to introduce rescue tool carrying handles with integrated LED lighting. This overcame the problem of rescuers having to work in their own shadow and allowed them to start their rescue activities before rescue scene lighting had been installed. Now, in addition to the doubling of the number of LEDs and the doubling of light output, the new type of LED incorporated into the handle provides light continuously for 12 hours, compared with the old six-hour design. The new lights are sunk deeper into the handle to minimise the risk of damage, plus there is a more robust on/off switch.

As standard, all Holmatro 4000-series cutters, spreaders and combi tools are equipped with the new carrying handle, which is also available as a separate item to upgrade existing tools in the market.

For more information, go to www.holmatro.com/rescue

Airservices Australia opts for Solberg Foam

Airservices Australia has changed to SOLBERG Re-Healing RF foam concentrate as its preferred operational firefighting foam. The concentrate will be used at all 21 capital city and major regional city airports throughout Australia that come under Airservices Australia's control.

The decision followed an exhaustive testing and trialling regime, and, according to Solberg, was based on the foam's superior firefighting and suppression capabilities. It meets ICAO (International Civil Aviation Organisation) Level B specifications and many other industry standards. The Re-Healing RF series contains no fluorosurfactants, no fluoropolymers and no fluorotelomers, so are readily biodegradable and can be sent to a waste water treatment plant for disposal. This compares with all other currently manufactured AFFF and AFFF/AR foam concentrates – including the concentrate that was used by Airservices Australia – that have been shown to contain fluorochemicals that are environmentally persistent, bio-accumulative (entering the food-chain) and toxic.

For more information, go to www.solbergfoams.com

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Graham Collins

Clean and Sustainable

Selecting the right clean suppression agent, one that will stand the test of time, continues to be the focus of much attention. But what do we mean by "clean", and what is "sustainability"?

When it comes to defining with any clarity what precisely the terms "clean" and "sustainable" mean, the devil, as we are often told, is in the detail. Certainly, there is no shortage of companies heralding their particular solution as fitting both requirements. So much so that there seems to be more than a little confusion in the marketplace for those selecting a suitable suppression agent from the options available.

What is banned is fairly straightforward; the Montreal Protocol on Substances that Deplete the Ozone Layer killed off Halon 1301. What might be banned, or at least have its use curtailed at some unspecified date in the future, is somewhat less clear. Certainly it is not unheard of for some suppliers to cast doubts on the sustainability of some competitors' products. The precise nature of the restrictions or the impact that this will have is, understandably, impossible to predict because, right now, we are often in speculation territory. Whether it is that a particular solution represents no risk to the room's occupants, causes no damage to sensitive electronic equipment, leaves no messy residue to clear up, or is non-conductive, it is not too difficult to find someone who will challenge the particular assertion.

It is not uncommon for statements about the continued use of some agents to include terms such as "might" as being synonymous with "will". Some companies have addressed this uncertainty –

and to be fair, uncertainty really does exist – challenge by offering warranties that promise to replace the complete system if its use is banned by legislation any time in the next so-many years. Such guarantees may well be attractive to companies that lived through the Halon decommissioning saga and are anxious not to revisit the expensive experience in a hurry.

The Kyoto Protocol (or to give it its full title, the Kyoto Protocol to the United Nations Framework Convention on Climate Change) had, as its goal, the reduction of greenhouse gas emissions, preventing dangerous anthropogenic – man-made – interference with the climate system. It targeted a basket of six gases: carbon dioxide, methane and nitrous oxide, along with three long-life industrial gases: Hydrofluorocarbons – more popularly know as HFCs – Perfluorocarbons and Sulphur Hexafluoride.

Sound straightforward enough? You might think so, but just take the case of CO_2 as an example (and I do cite it just as an example). Companies promoting its use argue that it is close to impossible to watch television anywhere in the world these days that does not mention Carbon Dioxide in the same breath as terms such as "carbon footprint", "emissions trading" and "global warming".

This focus, they claim, has inevitably led to a considerable amount of misunderstanding about CO_2 and its role as a firefighting agent. Their argument is that CO_2 is a gas that occurs naturally in the atmosphere and that the gas used as a firefighting suppressant is extracted from a number of normal CO_2 producing processes; it is then stored until it is needed. They contend that its use in fire suppression systems results in a net removal of CO_2 from the environment, and that its use in fire protection is, in any case, insignificant when compared with the potential damage caused by an uncontrolled fire or the large quantities of CO_2 emitted as a by-product of many industrial processes.

But, the Kyoto Protocol was not interested solely in the fire protection industry, so perhaps it is worth bearing in mind when trying to form an opinion on sustainability that critical-use applications such as computer suites and IT centres are believed to represent a very small share of the fire protection market. Globally, studies have suggested, that this may be no more than three percent to four percent of the overall firefighting market.

That being said, business continuity, crisis management and disaster recovery planning are terms with which we have all become increasingly familiar in the past decade or so. At any particular time, there seems to be a major conference taking place somewhere around the world addressing one key issue – how to ensure that the business survives a major disaster.

While this has always been a concern for businesses, their increasing dependency on communication and computer technology has shifted the fire protection attention away from assets generally. Today the concern is very definitely focused on safeguarding those assets that have the potential to debilitate or possibly destroy the business if they fall victim to fire. So much so that the terms "mission-critical asset" and "business-critical asset" are now in commonplace use.

Just about every type of business is affected. Banks and other financial institutions face a total inability to conduct financial transactions; call centres, upon which many insurance, travel and retail businesses now depend, risk being put out of operation; and offshore petrochemical platforms are confronted with the prospect of $millions in lost revenue for every day a production platform is out of commission. Merchant shipping safety is jeopardised if fire breaks out in an engine compartment or control room; even a country's defence is compromised if a strategic command centre is damaged or destroyed by fire.

But, there is no getting away from the fact that this increasing dependence on key assets has occurred at a time when society has also placed unprecedented importance on protecting the global environment.

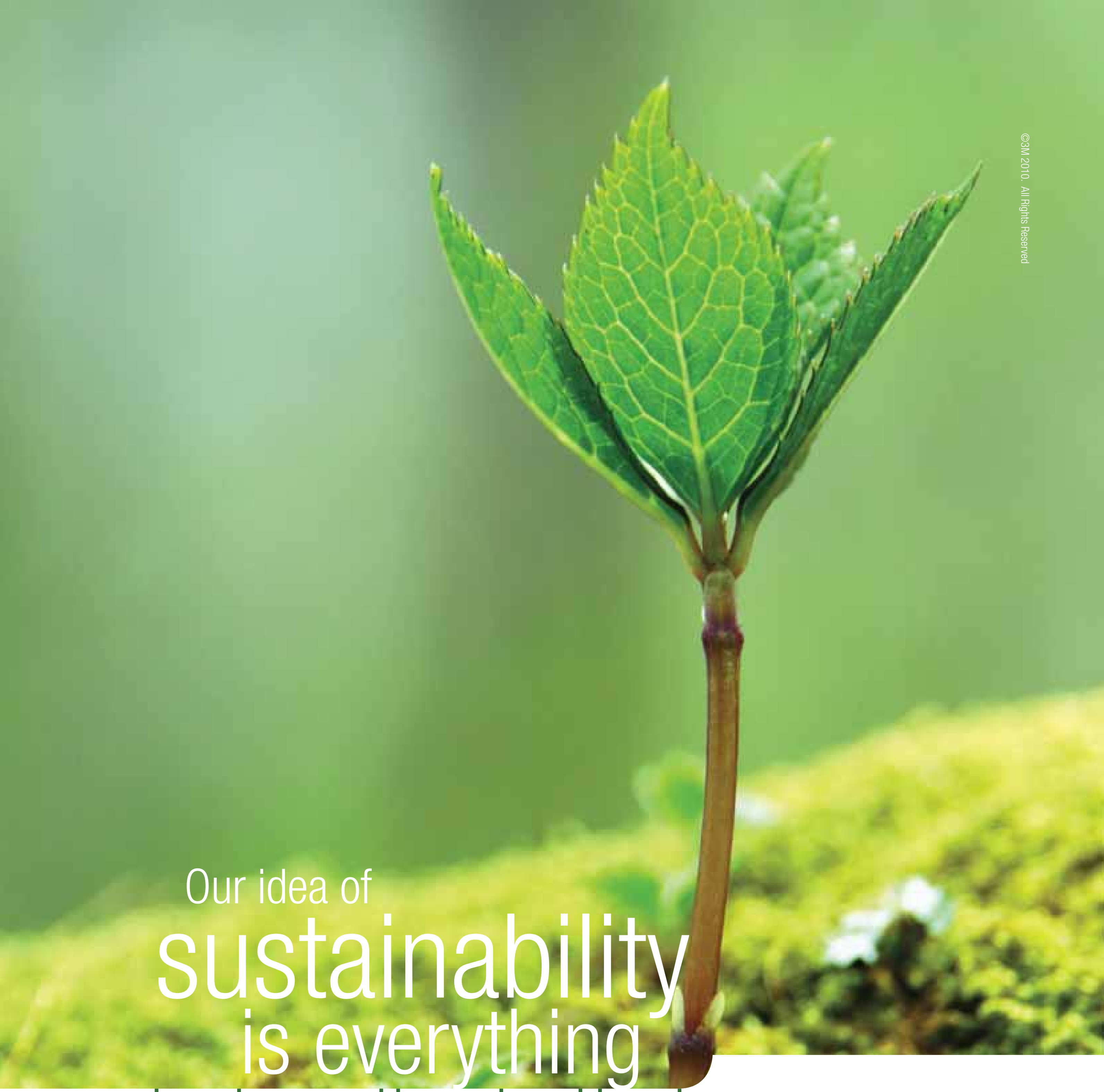
Rainfall patterns are changing as can be seen by the increased flooding, as the people of Australia, China, Pakistan and Sri Lanka will bear out; sea levels are rising; glaciers are retreating; polar sea-ice is thinning; and the incidence of extreme and unseasonal weather is increasing.

There is no getting away from the fact that our increasing dependence on key assets has occurred at a time when society has also placed unprecedented importance on protecting the global environment.

If this trend continues, scientists predict that it is inevitable that there will be permanent flooding of many low-lying regions. Heat waves have already proved fatal to the old and infirm, and there are real concerns that heavy rainfall can increase the incidence of water-borne diseases such as typhoid, cholera and malaria. Water-borne diseases already fill half of the world's hospital beds. At the same time, two-fifths of the world's population already face serious water shortages.

So, whether all of the fire suppression solutions currently being used are universally accepted as truly clean and sustainable is the question we need to address. But in order to do that, perhaps what we need to agree on is a common understanding of precisely what "clean" means. Does, as many would argue, it means that "zero" is the only acceptable figure for an agent to qualify truly as "clean and sustainable"– zero ozone depletion potential; zero atmospheric lifetime; and zero global warming potential?

To paraphrase Winston Churchill, where we are now is possibly not the end of the debate; it may not even be the beginning of the end, but it may be, perhaps, the end of the beginning of the search for agreement on what constitutes a clean and sustainable agent. I feel sure some will agree, just as I am sure some will not. APF



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Selecting the Right Proportioner

Keith Klassen

Waterous

Today's market is flooded with a wide variety of foam proportioners. They have different methods of operation and some are more appropriate than others for certain situations. However they all have a common purpose – to create foam solution in the correct percentage.

Foam solution is simply a mixture of foam concentrate and water and the percentage of foam solution required will vary according to the type of concentrate used and the tactical objective when using the product. Class A concentrates are designed to be used on fires involving ordinary combustibles, and are typically used in percentages of 0.1% to 1.0%. Varying the percentage will change the consistency of the finished foam – the combination of foam solution and air that has been agitated to form bubbles. Increasing the percentage will make a stiffer, slightly drier finished foam. More importantly, the increased amount of concentrate will cause the foam bubbles to hold water for a longer period.

Class B concentrates are typically used at 3% or 6% although there are some 1% concentrates on the market. These concentrates are for incidents involving flammable liquids, and the percentage selected is determined primarily by the product to which it will be applied.

Foam proportioners can be broken into two major categories: manual and automatic.

Manual proportioners require some operator attention to keep them working at the correct percentage as conditions on the incident change.

Automatic proportioners sense various parameters and adjust to keep the percentage accurate as conditions change. This makes automatic units much easier to operate, as turning on the proportioner and setting the percentage is normally the only operator input required. There are numerous systems on the market in both of these categories, so here we will examine only the most commonly used methods of proportioning in each category.

Manual proportioners

In the manual proportioner category we will look at batch mixing, educators, and bypass educators.

Batch mixing is the simplest way of creating foam solution and is done by pouring the proper amount of foam concentrate directly into the water tank. For example a 1,000 litre water tank to be mixed at 0.5% would require five litres of foam concentrate. This method is used only if the apparatus has no foam proportioner or, as a 'Plan B', to create foam solution if the existing proportioner becomes inoperable.

Foam eductors come in various sizes depending on the amount of foam solution needed. Eductors may be portable, so that they can be attached to a discharge, or inserted in the hose line. They may also be mounted on the apparatus and plumbed into the discharge plumbing. Foam eductors operate using the Venturi Principal; the eductor's inlet has a large diameter as compared to the small diameter in the centre or Venturi area of the unit. The outlet of the eductor returns to the original inlet diameter. The result is that all the water entering the eductor is forced through the small centre opening.

In order for this to occur, the velocity of the water must increase as it passes through the small diameter. This increase in velocity reduces pressure in the Venturi area, which allows the foam concentrate to enter the water stream as atmospheric pressure pushes on the concentrate in the foam bucket or tank. This is the same principal by which carburettors provide fuel to engines, and airplane wings create lift. Eductors are typically pumped with a 200-psi inlet pressure. This is due to the high friction loss, roughly 30%, through the small Venturi area.

Foam eductors are situation sensitive, and they must be operated in precisely the correct parameters to operate effectively. For example, the flow through the eductor must match its rating. Incorrect flow will affect the pressure drop through the Venturi and therefore prevent its operation. To ensure the correct flow the eductor must be matched to a correctly adjusted nozzle, which must discharge at a constant rate.

Another factor that will disrupt the eductor's operation is any condition creating 5 psi or greater back-pressure down steam of the educator. Because flows during the operation must remain constant at the rated litres-a-minute, the use of an eductor is problematic for Class A foam firefighting where lines are constantly being opened and closed. Eductors work much better in Class B operations, where foam is being flowed constantly on a fire or a spill for a longer period of time.

Bypass educators work on the same principal, as the educators previously described with one major difference. Instead of the entire water stream passing through the educator, a small portion of the stream is diverted through the educator venture, where it draws-in the concentrate, creating a foam solution. This solution then returns to mix with the remainder of the stream. The advantage is that bypass educators are much less sensitive to specific pressures, flows, and down-stream backpressure in order to operate properly. This makes them less situation sensitive and much more user friendly.

Automatic proportioners

Automatic proportioners include balanced bladder, balanced pump proportioners, and electronic direct injection systems.

Balanced proportioner systems provide a method to keep the foam concentrate pressure

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equal to the water pressure. This can be done by using water pressure to squeeze a bladder containing the foam concentrate, or by using a water-driven foam pump. It can also be done by controlling the pressure created by a foam concentrate pump typically driven by an electric motor. Relief valves or diaphragm controls are often used. With the concentrate and water pressures equal a simple pressure differential valve in the foam manifold will allow the concentrate to enter the water stream. The more water that flows through the differential valve, the greater the pressure differential and therefore the more concentrate enters the stream. This keeps the foam solution percentage constant as flows change.

By far the most common most accurate proportioners on the market today are electronic direct-injection systems. As the name implies they are electronically controlled and inject foam concentrate directly into the foam manifold.

These systems sense various parameters to determine how much concentrate to inject into the water to create the correct percentage foam solution. All systems sense water flow volume, typically using a paddle wheel flow meter; the more water that is flowing, the faster the wheel spins, creating an electronic signal. Some proportioners sense water temperature, which is a factor because it is easier to mix foam concentrate with warm water than cold water. Other proportioners also sense conductivity, as measuring conductivity is an accurate way to check solution percentage. It also can help control the variables inherent in both water and foam concentrates that effect the foam solution produced.

These systems do this by first measuring the conductivity of the water entering the proportioner, then measuring the conductivity of the foam solution exiting the proportioner and comparing the values to ensure that the percentage is correct.

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The proportioner sensors feed their information to a computer that calculates the volume in foam concentrate to inject. The computer then controls the speed of the injection pump – the faster the pump spins the more concentrate will be injected. The system is a closed loop that is constantly sensing and adjusting, keeping the percentage accurate as lines are opened or closed.

When selecting an electronic direct injection proportioner some careful considerations must be made in order to obtain the system that best fits the fire department's needs. These proportioners come in a variety of sizes measured in foam concentrate litre-a-minute flow capacity. They range from six litres-a-minute on the low end, to over 45 litres-a-minute on the high end. However, bigger is not always better, so size the system to fit the need. There are two factors that determine the need. The first is the volume of foam solution needed; a wildland fire truck that typically flows low volumes will only require a low litre-a-minute proportioner. Over sizing the proportioner in this application causes problems because large systems have decreased low-flow accuracy and at times intermittent low flow operation. A structural pumper that may be called upon to flow foam master streams will require much higher concentrate flow capability. This will call for a large capacity proportioner to keep up with the concentrate demand of high water flows.

When selecting a foam proportioner, consider first the mission of the apparatus and the volume and type of foam that will be needed. Then select the system that best fits the need.

The second factor is the type of concentrate to be used. As mentioned earlier Class A concentrates are used at low percentages, up to 1%, while Class B concentrates may be used at much higher percentages. The higher the percentage the more volume of concentrate will be required to treat a specific volume of water. For example, when using Class A foam at 0.3% 12 litres of concentrate will treat 4000 litres of water. Using Class B foam at 3.0%, 12 litres of concentrate will treat only 400 litres of water.

There are also some options that should be considered when selecting a proportioner. The first is a dual tank selector.

If more than one type of concentrate will be used they will need to be stored in separate tanks and a selector switch will be needed to switch between them. Tank selector switches are available in both manual and electric versions that have a flush position. This is necessary because Class A and Class B concentrates are not compatible and can gel if mixed. The flush position allows the proportioner to be cleaned before a different concentrate is used.

A dual tank selector switch can also be used with a single tank and an overboard pick-up. The overboard pick-up provides the ability to switch to a concentrate not normally carried, or to draw from a large supply on a big incident. If specifying an overboard pick-up be certain that the proportioner being used is capable of drafting from the outside source. The second option is a foam refill system. This system consists of a pickup tube, pump, and plumbing to refill the onboard foam tank from ground level. This is highly recommended for firefighter safety as it eliminates the slip trip and fall hazard of climbing on top of the apparatus with foam buckets.

When selecting a foam proportioner consider first the mission of the apparatus and the volume and type of foam that will be needed. Then select the system that fits the need and falls within the fire department's budget limitations. Doing some homework prior to selecting a proportioner eliminates future problems and make the system user friendly. **APF**

Keith Klassen is CAFS Instructional Program Manager at Waterous

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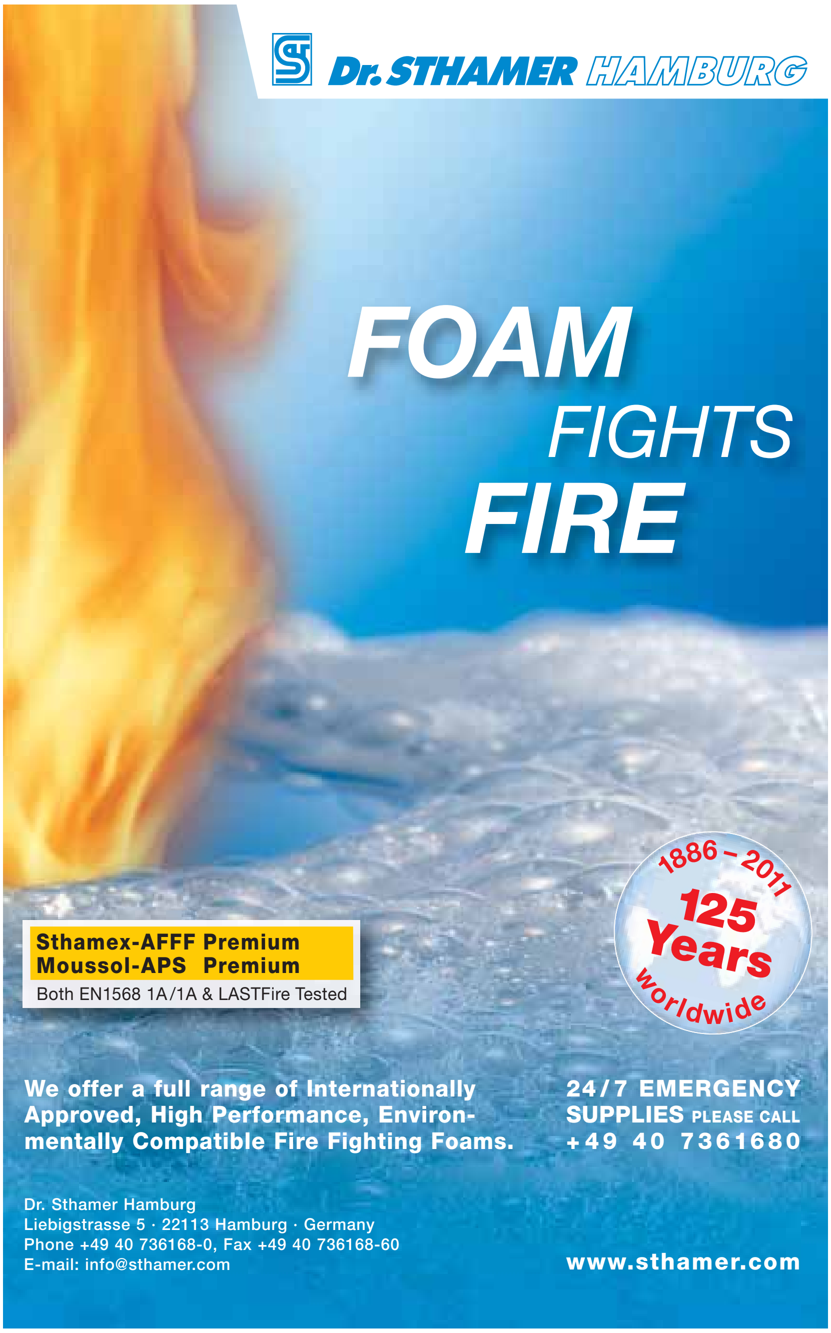
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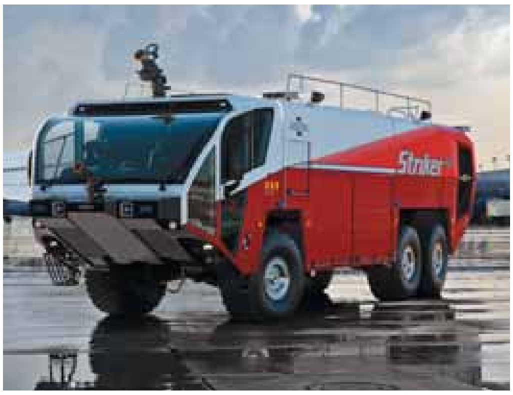
What's New on the Vehicle Front?

Graham Collins

Anyone who has visited any of the recent emergency services exhibitions will confirm that the development of firefighting vehicles continues apace. Here we take a look at just a few of the new vehicles that will soon be appearing on fire department shopping lists.

OSHKOSH is positioning its new Oshkosh Striker as "the world's premier Aircraft Rescue and Fire Fighting (ARFF) vehicle". According to Jason Shively, Senior Chief Engineer for Oshkosh Airport Products: "When the ARFF vehicle you are custom-building for a busy airport is going to be in service for ten to 15 years, you had better design and build it with longevity in mind.



The new Striker was three years in development and, says Oshkosh, incorporates innovative fire suppression technologies, improved chassis performance, advanced safety systems, greater reliability and durability, and a smart overall design that makes it "an ideal first choice for airport emergency response teams".

While the Striker has been chosen by major North American airports for years, the new generation Striker is designed for the world market and follows a year of discussions with US and international airport fire chiefs, firefighters and fleet maintenance managers, dissecting their current trucks, asking them what they liked and disliked, and what worked best for their applications.

Firefighting systems are significantly improved, and include the Pulse Technology dry chemical system that allows firefighters to operate at a 27-metre standoff instead of a typical 12-metre standoff.

"Bigger aircraft means the potential for more challenging emergencies, and Pulse Technology makes the new Striker as effective as current dry chemical systems at over twice the distance – which, of course, translates to a much greater safety margin for firefighters," Shively contends. The Striker's pulse-delivery technology shoots packets of dry chemical powder – automatic weapons style – to improve both the accuracy and the effective standoff distance, and dramatically lessens any loss of performance due to the effects of wind. Fire departments can also choose between 6000 litres to 12,500 litres of water, in addition to a wide range of foam systems and Halotron for true triple agent firefighting capability.

Centralized steering provides the operator with a seating position that enables the firefighter to scan and interpret everything that is happening – from getting a clear view on both sides when crossing a busy taxiway, seeing details of a developing situation, to watching for obstacles or hazards when manipulating the turrets. The new chassis also has side slope stability, while a tighter turning radius and a disc-brake option improves both manoeuvrability and safety.

The Striker's simplified controls are aimed at reducing training time and improving operator efficiency. For instance, there are only 39 rocker switches, over a third less than in the current generation Striker, and their functions are now grouped and colour coded – for example everything that controls water pumping is blue.

"The reduced switch count and colour coding simplifies training, allows smaller teams to do more, and improves response time in the heat of battle – all critical assets to both department operations and responding to incidents effectively," Shively notes.

Perhaps even more importantly, the CAN-based electronics are divided into three groups (drive-line,

firefighting controls and cab turrets), so if a malfunction should ever occur – such as in the drive-line – all key firefighting systems will still work independently. The three zone electronics also speed up diagnostics and repair. To meet the demands of the world market, metric fasteners have been used throughout the vehicle.

The new Striker boasts a curb weight that is 900 kilograms lighter than the current model. This is significant, because every 900 kilograms taken out of the vehicle reduces its zero-to-80 kpm acceleration time by a second – a crucial advantage as aircraft rescue vehicles now respond to more types of incidents, including medical emergencies, on a daily basis at busy airports. Recognising the potential for smaller crews in some departments, Oshkosh designed the Striker to be driven to an incident by a single operator who can then respond effectively.

The new Striker's powerful 700-hp turbodiesel engine meets the latest EPA Tier 4i and Euro emissions standards. Maintenance functions are also improved, with key service points and components such as filters all grouped together. There is even walk-in access for the engine, fluid checks, and valves for foam and dry-chemical firefighting systems. Its new interior has a more automotive-style design with features such as a sound-absorbing formed headliner and three-point seatbelts for all seating locations. Firefighters are further protected by a strong cab designed to meet ECE29 rollover protection standards.

All of the new Striker's vehicle systems conform to both FMVSS and Euro standards and switches are marked with ISO symbols instead of lettering. Where differences may exist between standards, such as in light type and positioning, the Striker is designed to accommodate both DOT and Euro lighting standards.

Extended series

German vehicle builder, ZIEGLER, has extended its Z-series 8x8 airport crash tenders with the introduction of a 6x6 option utilising the proven Alpas-grp concept, Ziegler pump technology, and Can-Bus control with large-sized, coloured TFT displays in the driver's cab and at the pump control panels.

The Ziegler FLF 80/125-15 + 250 P Airport Crash Tender Z6 has a water tank capacity of 12,500 litres and a foaming agent capacity 1,500 litres. A fire pump has a nominal output of 8,000 litres-a-minute at 10 bar, while an optional high-pressure pump has a nominal output of 250 litres-a-minute at 40 bar. A rapid intervention system comprises a swivel-type GRP reel body with 50 metres of non-collapsible delivery hose.

Ziegler Z6

The all-wheel 4x4 Ziegler TLF 10/20 is described by Jörg Hitzler, Ziegler's Export Sales Director, as: "A small and flexible pumper on a perfect off-road Unimog chassis that has advantages in small and narrow city streets as well as in fighting forest fires in difficult to access areas". It has a wheel base of 2.7 metres, a permissible total weight of 9,300 kilograms, a 2,500 litre water tank, a turbo foam proportioner with proportioning rates from 0.5% to 6%, and a roof turret.

Ziegler U20

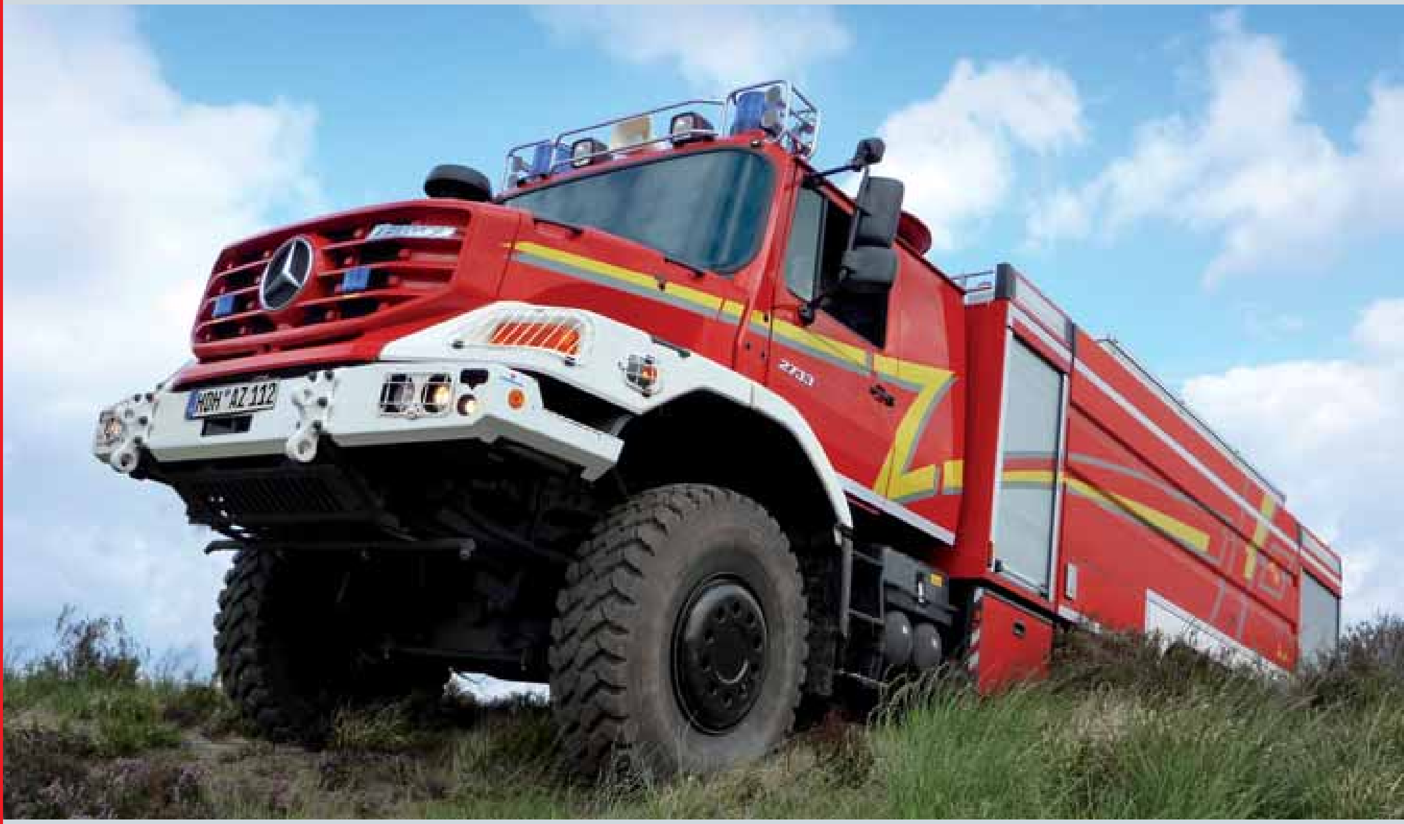
Alongside this small unit, Ziegler's Zetros tanker offers what Hitzler describes as: "High off-road capabilities and a huge payload, to provide large volumes of water for smaller units. It can also be used as a fully-equipped pumper." The TLF 30/90-5 has a water tank capacity of approximately 9,000 litres and a foam tank with a capacity of approximately 500 litres. Its centrifugal fire pump has a nominal output of 3000 litres-a-minute at 10 bar and foam proportioning rates are 2%, 3% and 6%.

New rescue height

Except for brief periods, BRONTO SKYLIFT is said to have held the world record for the highest truck-mounted platform continuously for more than 20 years. The company's latest world record platform, the Bronto Skylift F 112 HLA, has a 112-meter rescue height and a maximum side outreach of 32 metres. The first unit will be delivered shortly.

With rescue heights increasing, aerial vehicles have amazingly become more compact. This has been achieved through Bronto Skylift's year-long product development, and by co-developing stronger but thinner steel grades with the steel supplier. The new 112-meter unit is designed to move at regular speed in normal traffic without

ZIEGLER high capacity water/foam tender TLF 30/90-5



Wherever big water supply is required and off-road capabilities are decisive the water/foam tender on Mercedes-Benz chassis ZETROS 2733 A 48 with the ZIEGLER superstructure and pump technology is the answer.

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special permits, and once set up for work it does not block the entire street. After arriving at the scene it takes only few minutes from the moment the driver parks the vehicle to when the unit is set up and is ready for rescue operations. The levelling of the unit can be done automatically with one button in less than a minute. The unit has permanently fixed footplates so no manual adjustment is needed, plus there is an integrated corrosion-resistant waterway up to 112 meters with outlets in the cage.

It has been designed for maximum safety and efficiency in big metropolitan cities. As a standard feature it has a Bronto + electronic control system, which lets the firefighter focus on his or her main task. The system has an outreach control with variable cage load and, despite the enormous outreach and the 500 kilogram cage load, at any height the movements are stable and fast.

Versatile option

FERRARA FIRE APPARATUS is adding to what it describes as "a complete line of fire and emergency vehicles", with the launching of several new products. This includes the Ember MVP HD-77, which combines the firefighter safety features on the company's MVP pumper with the value of the Ember chassis and fire-rescue capabilities of the HD-77 aerial unit.

The Ember MVP HD-77 has Ferrara's standard 4.76mm thick, all-aluminium cab and body with extruded aluminium framework. The Ember seats up to ten, and the cab has a 300mm high, forward raised roof that is notched to accept the aerial ladder. This raised roof provides occupants with extra headroom, while taller doors make it easier to exit the crew cab.

The new vehicle puts the pre-connected attack hose lines down low, making it much easier and safer for firefighters to deploy and reload the hose. Two of the three attack lines are roughly 1.14 metres above street level, located between the chassis frame and a notch in the lower rear crew cab. The MVP also has dedicated stokes basket and backboard storage above the upper attack line. The additional compartment space in the MVP gives fire departments the ability to carry large amounts of both rescue and firefighting equipment.

The fire body has ample storage space with full height compartments on the left side, which are nearly 610mm deep. The right side of the vehicle also has a full height compartment ahead of the rear wheels and Ferrara's EZ-Stack hose bed. This hose bed allows firefighters to reload fire hose without having to raise the aerial ladder. The hose bed is five metres in length with 1.7 cubic meters of storage. Ground ladders are stored in the full length, enclosed aerial torque box. Seven ground ladders with a combined length of 46 meters are included, along with six fire hooks.

The unit's three-section, rear-mounted aerial ladder is designed with a vertical reach of nearly 23.5 meters and a horizontal reach of over 21 meters. The ladder has a heavy duty design, with the capacity to hold 226.8 kilos while the pre-piped waterway is flowing 4,750 litres-a-minute.

Rescue Staircase

The E8000 mobile rescue staircase from ROSENBAUER is designed to meet precisely the requirements for the new generation of Super-jumbo aircraft. With a rescue height of up to 8.3 metres, it can safely reach the upper doors of the Airbus A380.

The main staircase is equipped with a very spacious top rescue platform, which facilitates the rapid exit of passengers from the aircraft as well as providing space for the supporting rescue personnel. It also offers sufficient space for a firefighting system for rapid and efficient firefighting inside the fuselage. The staircase can be extended fully from its storage position to maximum height in less than 70 seconds and incorporates pre-programmed, operational heights/positions for all of the most frequently encountered types and models of commercial airliners.

As a result of the 1.5-metre wide steps, three passengers can descend from the staircase side-by-side without any hindrance. In order to ensure safe movement on the staircase, a special mechanism

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ensures that irrespective of the staircase angle, the steps are always kept in the horizontal position. Fully enclosed sidewalls and a continuous handrail above the side panelling enhance the safety of the passengers when descending. A smooth transition to the ground is provided by a folding ramp at the end of the main stairs, and the bright, glare-free illumination of the stairs also increases the safety of both the evacuees and the rescue teams.

In many cases, the rapid response of a suitable rescue staircase ensures that the deployment of the emergency aircraft slides is not required. This guarantees the rapid and safer rescue of the passengers, saves the aircraft operator excessive and unnecessary costs, and minimises downtime of runways and taxiways.

Pumper Boosts Chinese High-Rise Safety

Following the disastrous fire in Shanghai last year when 58 people died and more than 70 were injured in what proved to be one of the most destructive high-rise fires in China in more than 30 years, the builders of the new Chongqing Hotel Shangri-La, Chongqing City Fire Department and PIERCE MANUFACTURING have ensured the firefighting capability for each of the hotel's 58 floors.

The Shanghai blaze erupted on the north side of the tenth floor of a 28-story building and, at one stage, was tackled by more than 1,300 firefighters with 122 fire appliances. In an effort to prevent similar tragedies in the future, the provincial fire control authorities have inspected facilities and have determined that firefighting capabilities are inadequate in many high-rise buildings. The highest aerial ladder trucks cannot alone successfully fight fires that occur more than 60 meters above ground level.

So, when the 286-meter high Chongqing Hotel Shangri-La opens later this year, the building's new fire suppression infrastructure has been designed to address the challenge. Central to this is a Pierce municipal fire truck. The hotel's new fire suppression infrastructure also includes a centrally located, vertical 102mm diameter standpipe system that reaches the top floor. At each floor, a strategically located 64mm hose and nozzle is on hand for responding firefighters.

The Pierce high-rise pumper outside the new Chongqing Hotel Shangri-La

A Pierce high-rise pumper will supply the essential firefighting power in terms of water pressure and vertical reach via the building standpipe infrastructure. A field test was conducted while the building was still under construction, and while the standpipe was only partially constructed. A combination of standpipe and hoses was used to bring water from the ground to the 58th floor; a less than ideal test condition for the fire truck. However, despite pressure losses along the winding hoses and connections, the test was a resounding success. The Pierce high-rise pumper was able to supply pressured water to the 58th floor in 30 seconds, with output pressure exceeding 3.5 bar.

The Pierce pumper at Chongqing features seating for six firefighters, a 400hp engine and a compact 4.37-metre wheelbase to navigate narrow streets. The firefighting system includes a 4,732 litres-a-minute two-stage pump, 457 meters of 63.5mm hose and 122 meters of 38mm hose, a 3,785-litre water tank, a Husky foam system with a 189-litre foam tank, and a compressed air foam system (CAFS) for faster knockdown and reduced rekindling.

The vehicle has an aluminium body with compartment storage for rescue tools and equipment, and includes storage for 14.6 meters of ground ladders. APF

During a field test, the pumper supplied pressured water to the 58th floor in 30 seconds with an output pressure exceeding 3.5 bar

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[†] Listings and Approvals vary by system and agent.

Protecting Business-Critical Engines

Scott Starr

Director, Global Marketing, at Firetrace International

Business critical assets come in all shapes and sizes, and vary from business to business. Engine fires may not be the first area to spring to mind unless, that is, your business continuity depends on them or when passengers' lives are at stake.

Vehicle fires are far more common then many of us realize. They can – particularly in passenger-carrying vehicles – have a devastating life-threatening impact. Fire can also cost the vehicle owner a great deal of money, and jeopardize the company's ability to continue to provide the level of service to which it may be contractually committed.

While vehicle fires are numerically fewer for off-highway vehicles than on-highway vehicles, the potential for financial loss is often substantially greater. Equipment such as log haulers, haul trucks and wheeled loaders cost hundreds of thousands of dollars. They can also take months to replace and their severe damage or destruction can have a serious detrimental impact on project timescales.

The common thread that links all of these vehicles is that mechanical and electrical failures or malfunctions account for the majority of fires – around 60% in the case of off-highway equipment, rising to 75% for on-highway vehicles. The most common location for the outbreak of a fire – in as many as 60% of the cases – is in or around the engine compartment, the running gear or wheel areas.

The conclusion that can be reasonably drawn from these figures is, therefore, that these are the areas most in need of detection and suppression and where investment in fire safety measures are likely to have the greatest impact and payback. However, the real nature of the fire hazard has to be taken into account if the detection and suppression solution is to offer the maximum protection.

In addition to the vehicle's fuel and the risk of fuel line ruptures, there are any number of flammable liquids present throughout any vehicle engine compartment. These include hydraulic, brake, automatic transmission and power steering fluids, plus combustible accumulated grease on the engine block, for which frayed or damaged electrical wiring can easily provide the ignition source. However, the payload carried by some vehicles and the terrain in which some operate means that some of the combustible materials found in or around engine compartments are vehicle specific. These include agricultural crops that, surprisingly perhaps, account for around

15% of the items first ignited in a fire, together with grass, sawdust and wood chippings.

Certainly, these risks can be reduced by regular and diligent maintenance, but even then engine fire will remain a constant threat, and effective engine compartment fire detection and suppression is the only dependable means of ensuring that a minor fire does not escalate quickly into a major vehicle-engulfing blaze.

Bus and coach fires

Fire is an ever present threat for bus and coach operators, even though many fires go unreported because the blazes are not recorded in a central database. As well as putting lives at risk, damage to the bus or coach can be extensive, and the operator's reputation for safety can be irrevocably tarnished.

A recently completed three-year study by the Norwegian Public Road Administration and the Swedish Road Administration concluded that as many as one in every hundred buses is involved in a fire incident each year. This is supported by testimony given to the United States' National Transportation Safety Board, which revealed that as many as 2,600 fires break out each year on buses in the USA alone, and that a great many more bus fires are never reported.

If a fire is allowed to spread from the engine or generator compartment to the passenger area, it is likely to engulf the entire vehicle, threatening passengers' lives. Even when nobody is injured either directly by the fire or when evacuating the bus or coach, the negative impact on public confidence in the operator is invariably significant and lasting.

Regenerative braking systems on hybrid diesel-electric buses, where energy that would normally be wasted when braking is recycled and used to charge the batteries, deliver significantly better fuel economy with greatly reduced emissions compared with standard diesel engine buses. However, they are another potential fire risk that, again, is best eliminated by installing a dedicated fire detection and suppression system around the rechargeable energy storage system.

Locomotive fires

The majority of rolling stock fires are the result of either a collision or derailment. However, locomotive fires do occur for other reasons.

Originally, locomotive traction motors and generator were DC (Direct Current} machines. However, following the development of high-capacity silicon rectifiers in the 1960s, the DC generator was replaced by an alternator using a diode bridge to convert its output to DC. This advance greatly improved locomotive reliability by elimination of the commutator and brushes in the generator that, in turn, overcame the potential for what is termed "flashover", which could result in immediate generator failure and, in some cases, start an engine room fire.

The development of high-power variable-frequency/variable-voltage drives, or "traction inverters," has allowed the use of what are known as polyphase AC (Alternating Current) traction motors, which also eliminates an historic fire problem with the motor commutator and brushes. The result is a more efficient and reliable drive that is better able to cope with overload conditions that often destroyed the older types of motors. Fires though do still happen.

So, many of the fire safety challenges present in road vehicles also apply to rail locomotives, particularly those relating to diesel engines and generator sets. However, trains also have several other high risk areas that need dedicated fire protection. These include driver's control panels, electrical panels and electrical distribution equipment, air conditioning units and heat exchangers, kitchen galley equipment, battery boxes and fuse boxes.

Dedicated detection and suppression

The dynamics of the airflow in and around an engine compartment when a vehicle is in motion can seriously impair the performance and reliability of traditional detection and suppression systems when heat and flame – that typically rise from the source of a fire – are likely to be propelled elsewhere. The inevitable build-up of dirt in and around engines, intense temperature variations and vibration are also factors that are known to cause traditional detection and suppression systems to fail to provide fast and accurate fire detection and suppression.

One resolution to these challenges that affect both front and rear-engined vehicles is Firetrace's automatic fire detection and suppression system, which can be fitted to new vehicles or retrofitted to existing vehicles. Firetrace is already being used to protect over 10,000 buses and coaches and there has never been a single instance where a properly installed and maintained Firetrace system has failed to detect and suppress a genuine fire.

Briefly, it is an automatic, self-seeking, intrinsically safe fire detection and suppression system that does not require manual activation or monitoring, virtually no maintenance and operates without electricity or external power source. It comprises an extinguishing agent cylinder attached to technically-advanced, proprietary Firetrace Detection Tubing. This polymer tubing is a linear pneumatic heat and flame detector that is immune to the vibration, shocks and temperature extremes found in vehicle engine and generator compartments. It was specially developed to deliver the desired temperature-sensitive detection and suppression delivery characteristics in harsh environments.

The dynamics of the airflow in and around an engine compartment when a vehicle is in motion can seriously impair the performance and reliability of traditional detection and suppression systems.

This leak-resistant tubing is routed throughout the engine compartment. Immediately a fire is detected, the tubing ruptures and the suppression agent is automatically released, extinguishing the fire precisely where it starts and before it can take hold. The tubing is placed both above and behind the potential source of fire to ensure that the airflow actually helps by directing the heat and flames towards the tubing, providing faster and more reliable detection and suppression. While many applications use the Firetrace Direct Release system, the Indirect Release system is the preferred solution for vehicle engine protection.

The Indirect Release System is the Firetrace tube as a detection and system activation device, but not for the agent discharge. The rupturing of the tube results in a drop of pressure causing the indirect valve to activate. This diverts flow from the detection tube and the agent is discharged from the cylinder through diffuser nozzles, flooding the entire enclosure. The Indirect System is available with an optional manual release, and an optional "alert" signal light and a horn that can be mounted on the driver's dashboard.

The extinguishing agent cylinder is usually mounted inside the engine compartment and, for vehicle engine applications, ABC dry chemical powder is the preferred choice, as it is suitable for the suppression of ordinary combustible, electrical, and flammable liquid fires that involve petrol, diesel, solvents, lubricants and spirits.

ABC Powder: insulates Class A fires – those involving freely burning materials such as wood, paper, textiles and other carbonaceous materials – by melting at between 350°F (182°C) and 400°F (205°C). The powder also breaks the chain reaction of Class B (Class B and Class C in Europe, Australia and Asia) fires – those involving flammable liquids such as gasoline, diesel, solvents, lubricants and spirits, and flammable gases such as butane and propane – by coating the surface to which it is applied. ABC powder is also safe and effective for Class C (Class E in Europe, Australia and Asia) electrical equipment fires since it is a non-conductor of electricity.

Suppressant Selection

While ABC dry chemical powder is an ideal suppressant for vehicle engine fires, other agents are available for other fire risks.

.The most popular are the clean agents such as DuPont FM-200 or the more recently introduced 3M Novec 1230 Fire Protection Fluid. Both are approved by UL (Underwriters Laboratories) and FM (Factory Mutual) and are listed in the appropriate codes and standards, such as NFPA 2001 (Standard on Clean Agent Fire Extinguishing Systems) and BS EN 15004:2008 (Fixed firefighting systems. Gas extinguishing systems).

Novec 1230, for example, exists as a liquid at room temperature. It is stored as a low-vapor-pressure fluid that, when discharged, transmutes into a colorless and odorless gas, using a concentration of the fluid that is well below the agent's saturation or condensation level. Both FM-200 and Novec 1230 are non-conductive suppression agents that have been used extensively in Firetrace systems, of which there are now more than 150,000 installations around the world. APF

Scott Starr is Director of Global Marketing at Firetrace International

For further information, go to www.firetrace.com

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Listen and Learn

In the majority of automatic fire systems, the end result of the detection of a fire is the initiation of audible or visual warning devices that alert the occupants to the danger so that they can evacuate the premises. So, the primary function of the system designer is to ensure that the output levels of these devices are adequate throughout the protected area.

Given the complexity and the variety of buildings and structures in which fire systems are installed, and variations in the homogeneity or otherwise of the occupants, it is clear that, for maximum effectiveness, many different types of warning devices will be required.

For example, one end of the spectrum may be an offshore oil rig, which is manned by highly trained workers who operate under strict safety procedures at all times; at the other end is a large retail development crowded with shoppers who are unfamiliar with the general layout of the building or the position of the nearest emergency exit. Clearly, the technical requirements for the warning devices and the nature of the warning signals themselves will vary greatly. The key consideration for the system designer is how to produce clear, unambiguous audible warnings throughout the protected areas in the event of an emergency.

Voice alarms

Voice alarm systems have unfortunately suffered adversely from historic confusion with PA (public address) systems, enshrined in most people's mind as the source of the muffled and incomprehensible announcements encountered in older railway stations.

Thankfully, modern technology and the introduction of robust standards mean that this perception is now no longer correct. In Europe, for example, the introduction of EN54-16, which defines the requirements for the control and indicating equipment, and EN54-24 that covers voice alarm loudspeakers, have defined test methods, environmental tests and performance criteria comparable with those required of sounders and strobes. BS 5839-8, the relevant British Standard code of practice for voice alarm systems, defines five different types of system, broadly increasing in complexity to allow for more complex site and messaging requirements.

Voice alarm loudspeakers will typically combine pre-recorded standard or custom messages with a choice of pre- and post-message tones, enabling, for example, phased evacuation instructions to be broadcast in larger buildings. Typical of this technology is the E2S Appello rang, which is available in industrial, marine and explosion-proof versions, allowing the more sophisticated instructions of a voice sounder to be made available in both interior

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and exterior locations across many different operating environments. BS 5839-8 indicates that, as a starting point for system design, the spacing requirement for voice alarms is broadly similar to that for traditional sounders, although intelligibility requirements and the wider frequency range associated with voice will normally require closer spacing when a detailed audibility survey is carried out.

Sounders

Many countries, such as Australia have a national 'evacuate tone'; the UK however does not. The relevant standard, BS 5839-1, merely states that the evacuate tone should contain frequencies within the range 500Hz to 1000Hz. However, for particular applications, such as offshore use, specific tones are defined. Known as PFEER – Prevention of Fire, Explosion and Emergency Response – as a minimum, there must be provision for three types of alarm on the installation or platform:

1. 'Prepare for evacuation' is a continuous constant amplitude signal with varying frequency of 1200Hz to 500Hz over one-second then repeated.
2. 'Toxic gas alarm' is a constant 1000Hz tone reinforced where necessary with a red beacon or strobe.
3. Other cases for alarm (Fire) is a 1000Hz, one-second on, one-second off tone reinforced where necessary with a yellow beacon or strobe.

In normal commercial environments, such as offices, hotels, hospitals and public buildings, the ambient background noise will typically be around 65 dB, and most individual areas are relatively small. Such environments may be covered with multiple sounders with typical outputs of approximately 100 dB(A) at one metre; even the traditional 150mm bell is effective in small installations, although not particularly compatible with today's low-current control systems. BS 5839-1 states that the effective distance of a sounder is when the calculated dB(A) is at least 5 dB(A) above the known ambient background noise, so the effective distance of a sounder in an ambient of 65 dB(A) is the distance at which the output level reduces to 70 dB(A). Using the inverse square rule/rule of thumb that the output falls by 6 dB(A) each time the distance doubles, the output will reduce by 30 dB at a distance of 32 metres.

In high background noise industrial environments, higher output devices are obviously needed, although there is always the danger of installing units with too high an output; high output sounders should not be used in low ambient noise areas or as a means of 'drenching' the area in sound. Alarm systems that are too loud may be dangerous, cause panic and discomfort and make communication very difficult, impeding evacuation procedures. The overall alarm level should be a maximum of ten to 15 dB(A) over the ambient background noise.

Wide-area sounders, with an output at one metre in excess of 140 dB, significantly higher than the human threshold of pain, have an effective warning range of between 500 metres and 750 metres depending on the atmospheric conditions. Used in quarries, on large industrial and petrochemical sites and for civil defence requirements, electronic wide-area sounders will normally generate multiple internationally-recognised alarm tones including fire, security, civil defence, alert, COMAH (SEVESO II) toxic gas alarms and disaster warnings for flood, tsunami, tornado and other severe bad weather conditions.

Electronic sounders are increasingly replacing the traditional electromechanical sirens, hooters, buzzers and bells that have been the mainstay of the wide area warning device market for many years. Now, complex new digital to analogue conversion software and the latest in SMD Class D amplifier technology enables E2S Hootronic sounders to mimic, in one product, an industrial hooter, high and medium frequency mechanical sirens, a buzzer and a bell with amazing fidelity.

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electro-mechanical devices with electronic equivalents are savings in power consumption and weight; traditional sirens and hooters can be extremely heavy and often need three-phase mains power. Unlike electro-mechanical devices, the Hootronic range is continuously rated, requires zero maintenance, three remotely selectable stages are available and signal quality and performance will not degrade with age.

Strobes

It is becoming increasingly common in both commercial and industrial applications for visual signals to be required to reinforce the primary audible warning device. A visual signal should never be used by itself as part of a life safety system, although they are widely used by themselves in industry to indicate machine state or environmental condition.

Advances in lighting source technology have generated a number of alternatives to the traditional Xenon tube as the basis for strobes. In particular, high-output brilliant white or monochromatic LEDs provide the benefits of low current draw, long life and simple electronic configuration and control.

The Xenon tube uses a very high voltage, generated by an inverter circuit, to break down the Xenon gas in the tube, creating an instantaneous brilliant flash of light, normally enhanced by using a 'Fresnel' lens. The light energy of the flash is a function of the Xenon tube size, the voltage across it and the capacity of the capacitor discharging into it. The Xenon strobe beacon has the best light output to power input ratio and is the most widely used and versatile technology currently available.

Tube life is critical: it may be as little as one million flashes in cheaper devices but specifiers should typically expect five million to eight million flashes from higher quality units. However, traditional Xenon tube beacons cannot perform to their full potential when managed through intrinsically-safe barriers for use in hazardous areas; the input energy that is allowed to pass through the Zener barrier or galvanic isolator is limited and, consequently, the performance of the Xenon tube is severely compromised, significantly reducing its light output. In such cases, the solid-state LED (light emitting diode) unit has far greater potential. An array of ultra bright LEDs produces a bright flashing warning signal when powered through a Zener barrier or galvanic isolator, overcoming the restrictions associated with a Xenon strobe.

Hazardous areas

Hazardous areas are defined as areas where concentrations of flammable gases, vapours or dusts may occur, either constantly (Zones 0 and 20), under normal operating conditions (Zones 1 and 21) or unusually (Zones 2 and 22). A whole series of additional conditions relating to the temperature classification and the auto-ignition temperatures of the type of gas or dust to be found ensure that any equipment will not initiate an explosion or fire.

Hazardous areas are to be found in a very wide range of manufacturing industries, far beyond the obvious petrochemical plants. Food, pharmaceutical and cosmetic manufacture all involve processing potentially explosive substances, while the problems of explosions in grain silos and sugar processing plants are very well documented.

There are two ways of ensuring that the sounder or strobe does not initiate an explosion when operated in a hazardous area: intrinsic safety of explosion proof. Simplistically, the input energy entering an intrinsically safe device is constrained so that any arcing or sparking within the unit cannot generate enough heat to start ignition. The alternative approach, explosion proof, is to house the equipment in an enclosure that is sufficiently robust to prevent any internal explosion from reaching the outside. Clearly, explosion proof devices will, by their very nature, be bulkier, heavier and more robust than intrinsically safe ones, and are therefore more likely to be installed in external applications, particularly as they will be environmentally sealed to IP66 or IP67 in order to achieve the degree of protection required.

Wide area coverage

Typically, systems consist of three individual sounders that are pole-mounted at 120° to give full 360° coverage; in order to minimise cabling costs, the systems are often battery powered and are radio controlled.

As well as providing wide-area coverage, such systems are often used on building and construction sites, where they provide excellent protection levels for the workforce. Typically, the sounders are initiated from radio manual call points, either through a system of master/slave control panels or directly if the system is self contained. Mobility is a key feature, with the individual units being moved around the site as the work progresses. Such systems are particularly useful on a temporary basis when construction work is being carried out on large or congested sites or for more permanent installations like those needing to meet obligations under the Control of Major Accident Hazard (COMAH) regulations.

Conclusions

Sounders, reinforced by strobes, are the primary mechanism for alerting people in the event of an emergency. Voice alarms are also playing an increasing part in providing protection, but whatever the warning system chosen, the primary function of the system designer is to ensure that the audible and visual output levels are adequate throughout the protected area. **APF**

Neal Porter is Sales and Marketing Director at E2S

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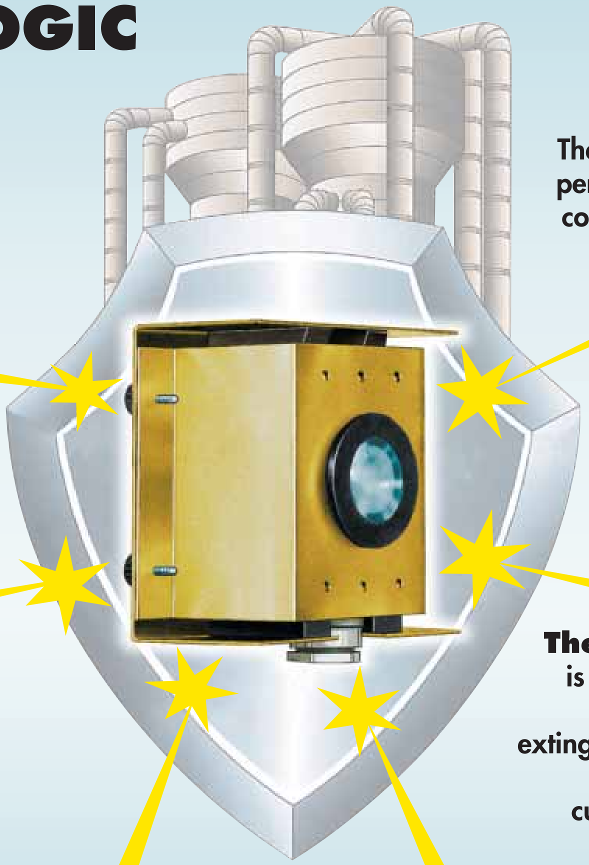

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PPV – The Changing Face of Fireground Ventilation

Roger Weinmeister

Super Vac

PPV – Positive Pressure Ventilation – is a firefighting technique that has consistently been improved since its introduction in the 1980's.

PPV was first introduced towards the end of the 1980s, prior to that time there were two different types of ventilation. These were vertical ventilation and negative pressure ventilation (sometimes known as smoke ejection). The latter technique being when smoke and fire gases are on the negative side of the fan, as opposed to positive pressure ventilation when smoke and fire gases are on the side of the fan where the pressure is positive. These techniques were generally utilised after there was no chance of survivability or after the fire was totally extinguished. Although they were effective for property conservation, they did little to help with life safety on the fire scene.

Since the introduction of PPV much has been written about its application, benefits, the need for training and assessing suitable applications for its deployment. However, the general consensus of professional firefighters around the world is that the technique, when properly deployed, offers some major benefits. The effective use of PPV increases visibility and significantly reduces air temperature, allowing victims and those fighting the fire a better chance of surviving.

What is positive pressure ventilation?

Positive pressure is achieved when air is forced into a building using one or more fans. These fans force air into the structure to create a higher pressure inside the building relative to the external atmospheric pressure. This pressure differential forces heat, gases and other products of combustion through a suitable outlet vent to the open air while replacing them with cool fresh air.

PPV makes a considerable contribution towards the removal of the large quantities of carbon monoxide and the other toxic and carcinogenic products that are present both during and after a fire. This has a welcome beneficial impact on the health and safety of the building's occupants and those entering the building to fight the fire. In many cases, fire victims can be supplied oxygenated, cool air due to the application of PPV, prior to being rescued by fire personnel. Additionally, it can help in the important job of maintaining primary and secondary egress routes, aid in locating the source of the fire, and the dramatic reduction in time-sensitive search and rescue times.

Hazards and risks

As with many modern firefighting techniques, PPV must be effectively and closely coordinated on the fireground. Lack of coordinating the opening of ventilation points, and applications of the fans is almost always the root cause in ineffective PPV application. It is imperative that the location of all interior firefighters is known prior to PPV being initiated.

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There are other considerations in applying the use of PPV. These include the production of CO and other by-products of combustion by PPVs powered by petrol engines. The use of exhaust extensions can minimise this risk, but must be applied carefully considering wind direction and the effect of very hot exhaust. Critics also express concerns over the size and weight of the equipment, what they see as the potential to jeopardise personnel safety if misused and the need for additional training.

However, in practice, these concerns have proven to be unfounded, particularly with the introduction of the latest PPV fans. Both firefighters and equipment manufactures readily agree though that training is absolutely imperative and that the deployment of PPV techniques needs to be seen as part of the overall firefighting tactical plan.

Tests have shown that the risk of trapping building occupants or firefighting personnel between the fire and the outlet vent is much lower than was originally thought and that the benefits far outweigh any potential disadvantages. The same can be said for concerns relating to the risk of igniting the hot smoke as it mixes with oxygen at the outlet vent. This can be easily controlled by proper training and providing a covering water stream at the outlet vent. In short, all of the recent studies have shown that the likelihood of PPV increasing the risk to occupants of the building are far outweighed by the rapid improvement of the conditions inside the building and more effective fighting of the fire.

Establishing proper controls

There are six steps that need to be taken to ensure that PPV techniques are effectively and safely

implemented. These can be summarised as the need to:

- Implement a phased approach to the introduction of PPV.
- Ensure proper training of the firefighting crews.
- Establish effective command and control procedures.
- Use the most suitable equipment.
- Establish essential fire ground communications.
- Adopt the most appropriate application techniques.

It has to be widely understood that PPV needs to be coordinated with other firefighting activities. One of the most effective methods to achieve this is the phased introduction of PPV – first in training scenarios, then on the fireground after the fire has been extinguished, and finally on the active fire scene. PPV should not be adopted as part of the fire ground operations until every member of the fire crew has a thorough appreciation of the use of ventilation, and how this affects the behaviour of fire.

At the site of the fire there are several questions that need to be answered. These include the size of the compartment to be ventilated, the location of the fire, the likely location of any casualties and an assessment of backdraught or flashover potential. Additional considerations are wind direction, determining the location of the essential outlet vent and the provision of water streams to cover the outlet and possibly nearby structures.

Clearly, PPV is not appropriate where there is a risk of either back-draft or flashover. In such situations vertical ventilation (or a variation of the same) is the only recognised safe solution. It is also not advisable to use PPV in conditions where the wind strength or direction will obviate the effects of the fan or fans. Generally, PPV should not be attempted directly against a wind of 20 Km/h or higher.

Latest PPV equipment

There are two growing trends in the use and application of PPV. The most significant is the increase in the use of variable speed electric motors to replace petrol driven engines. Variable speed motors have more rpm speed and can thus move more air than single-speed electric motors. This, coupled with the fact that they are extremely reliable, create less noise, and to not add CO and other by products of combustion into the air steam, contribute to their increased use.

Another growing trend is the increased use of very large blowers (VLB's). VLB's can extend the benefits of PPV to large structures, including high-rise buildings, large retail outlets, convention centres,

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warehouses, and tunnels. While portable PPV fans and fan groups can be effective with up to 20,000 cubic meters of interior space, larger buildings require significantly higher airflows. Just as vehicle-based ladders extended the reach over hand ladders as buildings grew taller, VLB's are extending the effective PPV reach as larger spaces are enclosed.

Another advantage to current PPV equipment is the increase in accessories designed to make ventilation safer, quicker and easier. There are currently many options that add lighting to PPV fans. These include large Halogen, Metal Halide, and LED lights to help illuminate the area around the fan and directly inside the structure. Misting attachments can be used to add the cooling effect of water to the airstream, plus there are foam attachments that can turn a PPV fan into a high expansion foam generator.

Application techniques

The successful use of PPV is also dependent on the number and positioning of the fans. Where a single fan is being used it needs to be positioned so that the stream of air is directed at the centre of the opening, with the cone of pressurised air just covering the doorway. An often-quoted rule of thumb is to position the fan the same distance from the doorway as the doorway height. It is important to ensure that the recommendations of the fan manufacture are used in conjunction with training to determine optimum positioning for effective airflow.

Where more than one fan is used, these are most effective if placed side by side in a "V", rather than in series, one behind the other. This placement increases the total airflow into the building, just as two different hose lines increase the total water flow available at the seat of the fire. Additional advantages of the "V" placement include a clear, straight path for hose lines and firefighters entering the building.

It is, of course, essential to create the outlet vent before engaging the PPV fan or fans. Ideally, this should be about the same size as the inlet opening as this helps to ensure maximum airflow through the building. This may well call for other apertures in the building – doors and windows – to be closed. Under no circumstances should the water stream positioned at the outlet vent direct water into the building while venting is taking place, as this could put firefighters inside the building at considerable risk.

Of course, many fires are in buildings that have more than one room, floor or enclosure. In such instances, the appropriate technique is to adopt what is known as sequential ventilation.

This involves providing the maximum volume of pressurised air to ventilate each enclosure in turn. This can be accomplished by sequentially opening and closing of doors leading to the various spaces. In extreme cases, it can mean manhandling the PPV equipment along corridors or up staircases and is why, if for no other reason, weight and manoeuvrability of the equipment is so important.

What next?

It is evident that there is a compelling case in favour of the use of PPV. This is particularly so following the introduction of the latest equipment that overcomes many of the earlier concerns and today's greater understanding of the need for training and fire scene control and communication.

This appears to be a view shared by many firefighting professionals around the world. There are many instances of opponents being converted into believers after seeing the effectiveness of this technique on the fireground. Undoubtedly though, all would confirm that the key to its successful use is to consider at all times that PPV is part of a well organised and coordinated fire ground operation. **APF**

Roger Weinmeister is president of Super Vac

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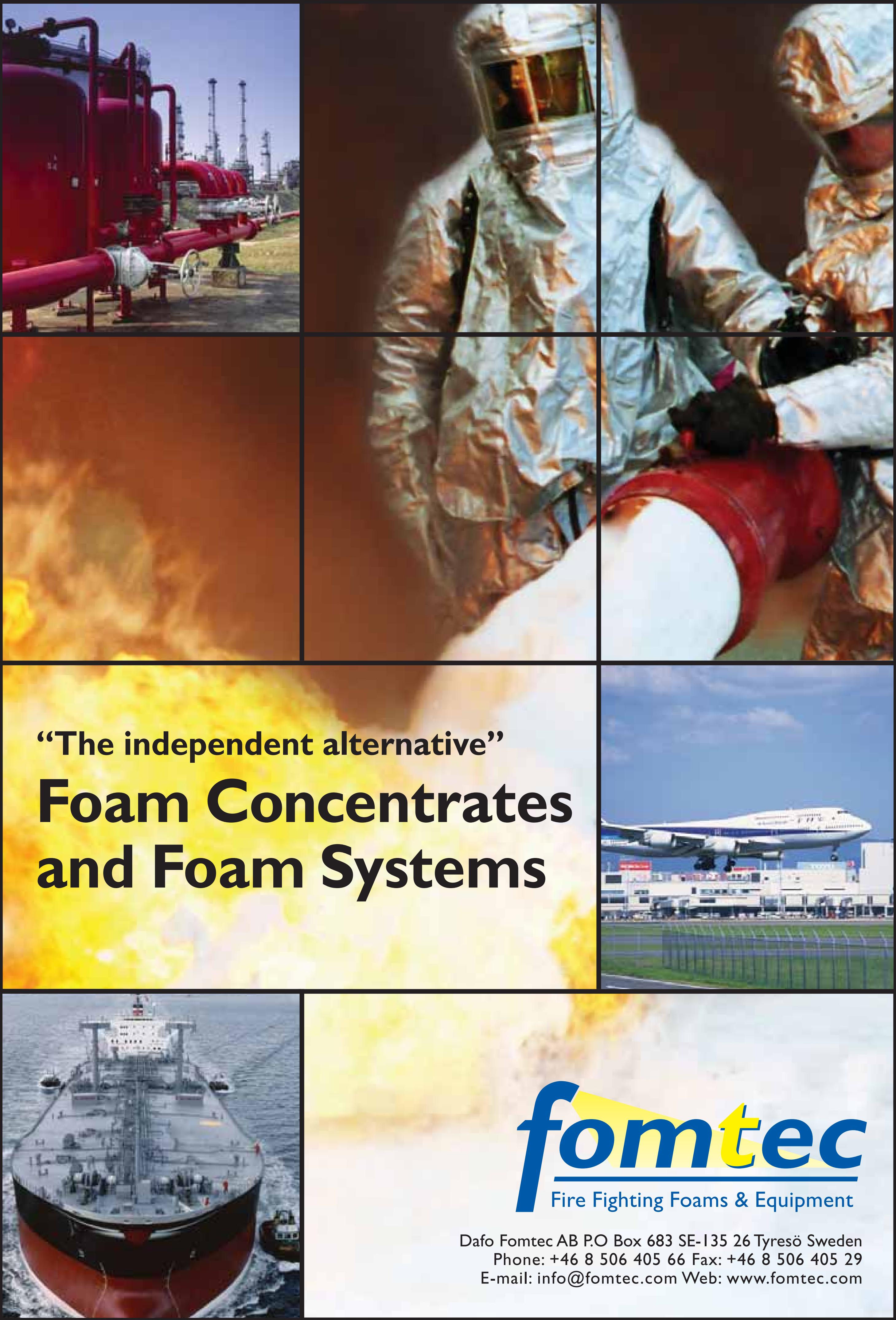

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All pics courtesy of Angus Fire, Kidde Australia and Fredric Gil

Storage Tank Protection

Kidde Australia

The environmental, social and investigatory impact of incidents involving Hydrocarbon and polar solvent chemical installations is increasing, which makes it all the more important to adequately protect these facilities from fire.

Hydrocarbon and polar solvent chemical products are generally increasing in demand and storage tanks are becoming larger and more sophisticated to contain these products safely and reduce costly evaporative losses. Recently developed techniques and improved devices can help achieve better and more reliable fire protection in the years ahead.

Swift action

The installation of fixed foam fire protection systems on bulk storage tanks is therefore increasingly important if swift action is to be taken to control and extinguish a fire once detected. These systems are designed to take a prescribed course of action and are usually quick and effective, minimising the risk of spreading to other tanks.

Many existing installations are manually controlled, relying on site firefighters to take action to activate these systems, or set up a mobile monitor attack. This may involve driving a fire truck to the tank, connecting hoses and pumping foam to the fixed system devices, all of which can take time and inherently accepts a level of risk that problems may occur preventing the truck or the foam getting to the specialised delivery equipment, delaying system activation. It may involve dedicated pump sets and extra large diameter hose (XLDH) feeding 40,000 litres of water and foam to trailer-mounted monitors capable of delivering foam onto the roof of large cone-roof or Open Top Floating Roof (OTFR) tanks to achieve control and extinction.

Automatic detection and activation can help save valuable time, but fixed systems need to be well maintained and regularly tested to remain quick and effective, but not everyone can justify the costs.

Minimising escalation

We are seeing an increasing use of smaller, combined automated detection and protection systems particularly for areas like rimseal protection on large open top floating roof tanks where sometimes inerting gas or, more effectively, an aspirated film forming foam spray is quickly delivered into the rimseal area to extinguish the fire before escalation occurs. Some of these units use nitrogen in special flexible tubing to detect the fire. Flame melts the tubing, dumping nitrogen and causing a valve to open and discharge water under pressure through a fixed inductor without moving parts to produce a reliable foam blanket around the rimseal area.

This is a valuable first-attack system designed to extinguish fires while still small and before activation of conventional rimseal pourers installed around the top of the tank. It can be a quick way to provide an automated response with an alarm signal back to the fire station, buying time for a manual assessment before activating the manual system. Such systems need to be well designed by specialists following a hazard risk analysis to ensure that every aspect is considered correctly and the most cost effective answer is provided to address the hazards associated with the particular installation.

Rimseal pourers

The design of conventional rimseal pourer devices is also important to maximise their efficiency and ensure much of the foam is not lost outside the tank due to wind effects, as often happens with the older style “cow horn” units”. Experience and testing shows that a more compact unit with wind cover and foam improvers inside the pourer unit will deliver better quality foam in contact with the tank shell directly from the pourer outlet. When a high performance natural protein based Fluoro-Protein (FP), Film Forming Fluoroprotein (FFFP) or Alcohol Resistant FFFP (AR-FFFP) is used, it adheres to the tank shell and resists wind effects significantly better than detergent-based Aqueous Film Forming Foams (AFFF) or Alcohol Resistant AFFF (AR-AFFF) versions.

The best of these rimseal pourer units can be retrofitted easily to replace older style units, and improve foam performance while matching the flow rate and inlet pressure characteristics. Such rimseal units use specially-approved clamp fixings and screwed connections, avoiding the need for tank decommissioning or welding, saving time and money.

Fast bund coverage

There is a surge of interest and use of medium expansion (MEX) bund pourers for large bunded areas. These modern MEX units operate best at just 2.5 bar g. inlet pressure, producing typical expansion ratios of 35-50:1 with FP foam. This is bulky enough to cover large bunds quickly and with the modern natural protein-based foams that can stick to bund walls, floors, tanks and itself – capable of resisting 80 kilometres-an-hour winds, which were verified during testing on a particularly stormy day. The use of leading modern natural protein based FP, FFFP and AR-FFFP foams work extremely well resisting wind attack and has encouraged many users to adopt these devices to achieve swift control and extinction.

Medium expansion foam produced from such units is excellent at submerging pipework, valving and leaking flanges, keeping them cool, protecting from radiant heat and minimising the risk of escalation. Its gentle application covers fuel spills without the frequent splashing and escalation risk associated with low expansion or non-aspirated nozzles and monitor use.

Top pourers

We are seeing an increasing use of internal floating roofs to reduce evaporation losses in cone roof tanks, but some older style top pourer sets have experienced premature vapour release to atmosphere, which is not desirable. Improved vapour monitoring systems around tanks are more frequently detecting occasional failures. Leading designs are now producing integrated units with a number of important benefits to overcome such frustrating problems and provide improved performance.

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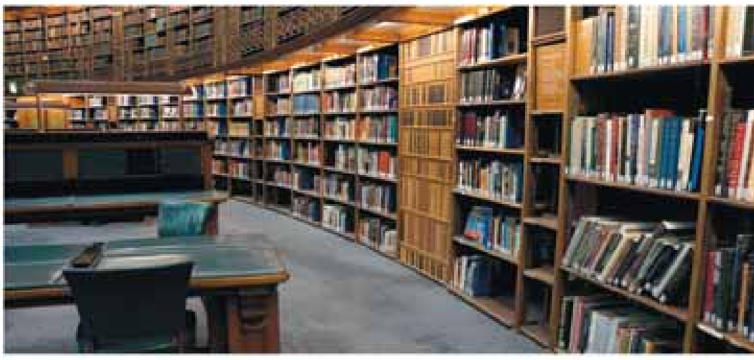

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designs mean the units can be quickly and easily fitted and fully tested with foam without risking a disc rupture, by opening the captive lid before foam production. An orifice plate design ensures control of air-to-foam ratio for optimum expansion, ideal for replacing old less effective units. Annual testing can ensure these systems are working correctly and fix any minor site maintenance issues so the system is permanently ready for action.

Fixed systems or mobile monitors?

This is a difficult question to answer, and depends on so many variables for each specific site.

Both can be a good answer and can do a good job, but many factors need to be weighed up before making the choice, including the existing fire protection philosophy and systems on site, the levels of hazard and risk associated with the site, the fire protection management policy, the operations team – their capabilities and experiences, the hazard management systems already in place, the site location and resources, whether there are capable mutual aid partners nearby, and so on.

In general, fixed foam systems are ideal for new facilities, those with some existing fixed systems, those with low manpower resources and those with high levels of hazard and risk, as they provide reliable and quick system activation in an emergency, especially when linked to automatic detection systems. Such systems do need regular – at least annual – maintenance, and functional testing to verify they are in good working order and will respond in an emergency.

Large sites with older tanks that have no fixed systems fitted can be uneconomic or unjustifiable to retrofit with modern fixed foam systems. Such sites may have limited tenure, may have low hazard and low perceived incident risk, or such a large number of storage tanks that protecting each with fixed systems might be prohibitive. Alternatively, existing familiarity with mobile monitor systems and a trained manpower team to deploy such equipment may make it the ideal choice.

One increasingly common answer is using an integrated package of large capacity trailer-mounted monitors, large or extra large diameter hoses (XLDH), dedicated pump sets and foam proportioning systems that can provide a cost-effective answer to such situations. Sharing the cost and training with mutual aid partners can also be an attractive solution, but it is important to train regularly and realistically, maintaining familiarity with the equipment in readiness for an emergency response.

Several such major monitor package systems were recently commissioned by groups of refineries in Japan. Among the big monitor systems chosen Iron Man monitors, Neptune pumping systems and 300mm Super Aquaduct XLDH, were the most popular. The hose is the heart of the system and Super Aquaduct is the most reliable and widely used large layflat hose in the world, delivering huge quantities with minimised pressure losses so system performance is maximised. Each package was also successfully tested to verify its performance and quick deployment capabilities.

For further information, go to www.kidde.com.au

New interpretation tool

Until recently, International standards have given no guidance on application rates and attack duration for these increasingly popular large monitor systems. Following reviews of actual fire response data and practical advice, the latest EN 13565-2:2009 standard on foam systems design makes clear recommendations on how much foam is recommended for these and more conventional foam systems.

A new pocket foam-application estimator has recently been produced. It helps provide a quick approximation for foam users of the amounts of foam and water resources required for hydrocarbon and polar solvent storage tank fires and associated spill and bund fires.

This can be a useful tool to help assess whether current foam stocks are still adequate for your site, or whether, in the light of recent incidents, it would be prudent to increase quantities, or upgrade your foam choice, to be better prepared, should a major incident happen on your site.

Integrated systems

In conclusion, it is good to see equipment manufacturers responding to industry needs with improved product designs , international standards providing guidance for new popular systems and responding to practical firefighting requirements, and users reviewing their systems and foam inventories to ensure they are better prepared should a major incident occur – which some say is only a matter of time.

Some leading manufacturers are going a step further by providing an integrated, cost effective specialist design, supply and commissioning service to ensure the installed system works effectively and efficiently from day one, and that there is only one place to go in the unlikely event that something should go wrong. This can only be beneficial to assist fire system decision makers come to better informed decisions about adequately protecting their organisation's staff, reputation and assets. APF

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DX1040	Anionic	●	●	–	–
DX1080	Nonionic	●	●	●	●
DX1090	Nonionic	●	●	●	●
DX1025*	Anionic	●	●	–	–
DX1026*	Anionic	●	●	●	●
Foam Stabilizers					
DX5022	Anionic	–	●	–	●
DX5065**	Anionic	–	●	–	–
DX5066**	Anionic	–	●	–	●

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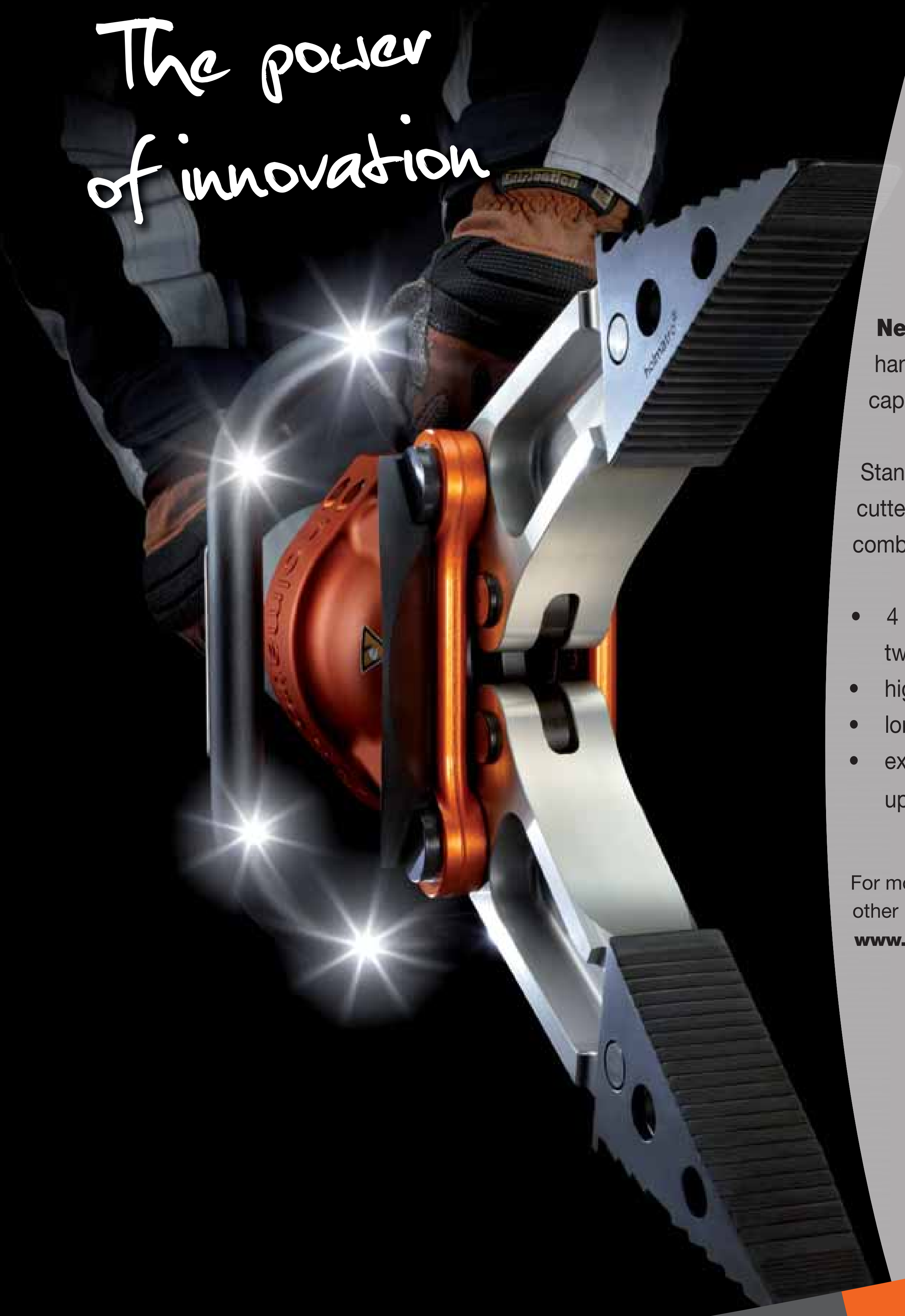

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Petrochemical's Gas Hazards

Andy Avenell

Crowcon Detection Instruments

Although flammable and toxic gas hazards are generally well understood by operators, technicians and safety personnel in the oil, gas and petrochemical industries, continuous training and refreshment of knowledge is essential to avoid potential incidents caused by complacency.

New personnel are often assigned work activities in potentially hazardous areas with only very limited training about gas hazards and the use of gas detection equipment. So, this article aims to offer a basic introduction to gases and associated hazards in the oil, gas and petrochemical industries.

What is gas?

Whilst different gases have different densities, they do not totally separate into layers according to their density. Heavy gases, for example, hydrogen sulphide, tend to sink and light gases such as methane tend to rise, but their constant motion means that there is continuous mixing.

So, in a room where there is a natural gas (methane) leak, the gas will tend to rise because it is lighter than air, but the constant motion means that there may be a considerable concentration at floor level. This will happen in perfectly still conditions, but if there are any air currents, mixing will be increased.

Air is a mixture of gases, but because its composition is reasonably constant it is usually considered as a single gas, which simplifies the measurement of toxic and flammable gases for safety and health applications.

Combustion of gases

Most organic compounds will burn. Burning is a simple chemical reaction in which oxygen from the atmosphere reacts rapidly with a substance, producing heat. The simplest organic compounds are hydrocarbons, which are the main constituents of crude oil and gas. Hydrocarbons are composed of carbon and hydrogen, the simplest hydrocarbon being methane, each molecule of which consists of one carbon atom and four hydrogen atoms. It is the first compound in the family known as alkanes. The physical properties of alkanes change with increasing numbers of carbon atoms in the molecule: those with one to four being gases, those with five to ten being volatile liquids, those with 11 to 18 being heavier fuel oils and those with 19 to 40 being lubricating oils. Longer carbon chain hydrocarbons are tars and waxes.

When hydrocarbons burn they react with oxygen from the atmosphere to produce carbon

dioxide and water (although if the combustion is incomplete because of insufficient oxygen, carbon monoxide will result as well).

More complex organic compounds contain elements such as oxygen, nitrogen, sulphur, chlorine, bromine or fluorine and if these burn, the products of combustion will include other compounds as well. For example, substances containing sulphur such as oil or coal will result in sulphur dioxide, while those containing chlorine such as methyl chloride or polyvinyl chloride (PVC) will result in hydrogen chloride.

In most industrial environments where there is the risk of explosion or fire because of the presence of flammable gases or vapours, a mixture of compounds is likely to be encountered. In the oil, gas and petrochemical industries the raw materials are a mixture of hydrocarbons and chemicals, some of which may be being altered by a process. For example crude oil is separated into many materials using processes referred to as fractionation (or fractional distillation); fractions are further converted using processes such as 'cracking' or 'catalytic reforming'. Flammable hazards are therefore likely to be represented by many substances on a typical petrochemical refining plant.

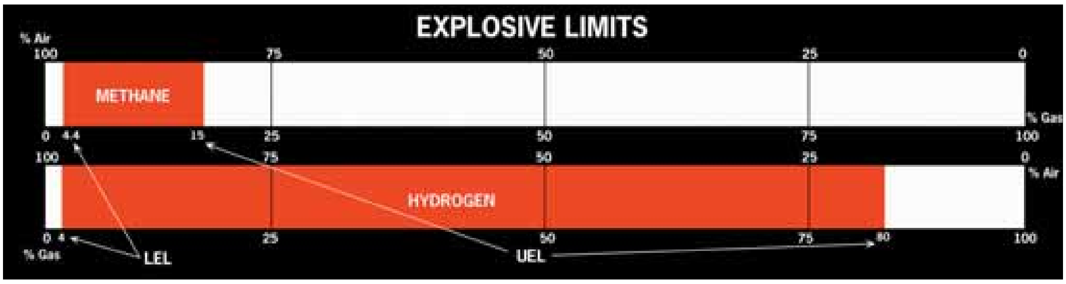
Explosive risk

In order for gas to ignite there must be an ignition source, typically a spark (or flame or hot surface) and oxygen. For ignition to take place the concentration of gas or vapour in air must be at a level such that the 'fuel' and oxygen can react chemically. The power of the explosion depends on the 'fuel' and its concentration in the atmosphere. The relationship between fuel/air/ignition is illustrated in the widely understood 'fire triangle'.

The 'fire tetrahedron' concept has been introduced more recently to illustrate the risk of fires being sustained due to chemical reaction. With most types of fire the original fire triangle model works well – removing one element of the triangle (fuel, oxygen or ignition source) will prevent a fire occurring. However, when the fire involves burning metals like lithium or magnesium, using water to extinguish the fire could result in it getting hotter or even exploding. This is because such metals can react with water in an exothermic reaction to produce flammable hydrogen gas.

Not all concentrations of flammable gas or vapour in air will burn or explode. The Lower Explosive Limit (LEL) is the lowest concentration of 'fuel' in air that will burn and for most flammable gases it is less than 5% by volume. So there is a high risk of explosion even when relatively small concentrations of gas or vapour escape into the atmosphere.

LEL levels for gases and vapours are defined in various international standards. The original long-established standards measured the LEL points



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using a static concentration of gas. More recent European and international standards list LEL levels measured using a stirred gas mixture: some substances are more volatile when in motion and represent an explosive risk at lower concentrations than indicated on previous 'static' tests. Methane is the most commonly occurring flammable gas in industry: the long-established Lower Explosive Limit is 5% in air, the 'new' LEL recognised in Europe and other territories is 4.4% LEL and calibration practices have been changed accordingly.

The propane vapour LEL is affected to an even greater degree: the 'old' LEL value being 2-2.2% in air (depending on which standard is referenced), the 'new' LEL being 1.7% in air. A more comprehensive list of affected gases and vapours can be viewed at www.talkinggas.co.uk'.

Flammable gas risk

Flammable gas detection equipment is generally designed to provide a warning of flammable risks before the gas reaches its lower explosive limit. The first alarm level is generally set at 20% LEL, with a second-stage alarm at 40% to 60% LEL. In some applications, such as gas turbine monitoring, alarms may be set as low as 5% LEL.

Toxic gas risk

Gases and vapours released from oil, gas and petrochemical processing activities can, under many circumstances, have harmful effects on workers exposed to them by inhalation, being absorbed through the skin, or swallowed. People exposed to harmful substances may develop illnesses such as cancer many years after the first exposure. Many toxic substances are dangerous to health in low 'ppm' (parts per million) or even ppb (part per billion) concentrations.

Given that 10,000 ppm is equivalent to 1% volume of any space, it can be seen that an extremely low concentration of some toxic gases can present a hazard to health.

It is worth noting that most flammable gas hazards occur when the concentration of gases or vapours exceed 10,000 ppm (1%) volume in air or higher. In contrast, toxic gases typically need to be detected in sub-100 ppm (0.01%) volume levels to protect personnel.

Gaseous toxic substances are especially dangerous because they are often invisible and/or odourless. Their physical behaviour is not always predictable: ambient temperature, pressure and ventilation patterns significantly influence the behaviour of a gas leak. Hydrogen sulphide for example is particularly hazardous; although it has

a very distinctive 'bad egg' odour at concentrations above 0.1 ppm, exposure to concentrations of 50 ppm or higher will lead to paralysis of the olfactory glands rendering the sense of smell inactive. This in turn may result in the assumption that the danger has cleared. Prolonged exposure to concentrations above 50 ppm will result in paralysis and death.

Definitions for maximum exposure concentrations of toxic gases vary according to country. Limits are generally time-weighted as exposure effects are cumulative: the limits stipulate the maximum exposure during a normal working day.

Alarm levels

It is important to note that, whereas portable gas detection instruments measure and alarm at the TWA (time-weighted average) levels, instantaneous alarms are also set at the same numerical values to provide early warning of an exposure to dangerous gas concentrations. Workers are often under risk of gas exposure in situations where atmospheres cannot be controlled, such as in confined space entry applications where alarming at TWA values would be inappropriate.

Gas detection systems

Both flammable and toxic gases pose serious hazards in oil, gas and petrochemical processing facilities. There can be a very diverse range of gases depending on the application. Multi-gas mixtures are also a common danger, especially in confined spaces. Fixed gas detectors can be positioned in strategic zones, and operatives undertaking maintenance or cleaning work, for example in confined spaces or 'hot work' areas, should always be equipped with portable gas detectors.

Most gas detectors should be calibrated every six months to ensure optimum operation. However, a new range of IR (infrared) detectors allow users to extend maintenance checks to once every 12 months – and this only requires a 'gas test', not full re-calibration, which is more time consuming. 'Bump-test' stations and intelligent instrument management hubs also enable simple day-to-day testing of portable gas detectors and easy management of maintenance cycles.

Future trends

It is likely that both portable and fixed hydrocarbon gas detectors will use IR sensors rather than the traditional catalytic bead (pellistor) sensors currently used in most detectors. IR sensors provide increased reliability, more dependable operation and increased lifetimes when compared to pellistors. The cost of IR sensors has fallen in the past few years, and a commercial case can easily be made for switching to IR technology.

Sensor technologies such as PID (photoionisation) are being used more commonly as requirements for monitoring levels of VOCs (volatile organic compounds) in industry increase. Optical sensing developments and solid-electrolyte sensors will provide solutions in toxic gas and oxygen sensing applications where traditional electrochemical cells have operating limitations.

Portable gas detectors will include features appropriate to a diverse range of applications with extended battery life and connectivity to other types of portable devices and control systems. Fixed detection systems will also continue to utilise a variety of technologies (such as point-type detectors, open-path detectors, acoustic sensors and even gas cameras) for the most comprehensive coverage. Wireless connectivity will replace cables in some applications. **APF**

Andy Avenell is Fixed Systems Product Manager at Crowcon Detection Instruments

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Abrasion damage to charged hoses. Pic courtesy of Kidde Australia

Choosing the Right Fire Hose

Kidde Australia

There is a perception that fire hoses are all pretty much the same, so why spend much time or money on them? Wrong – there are huge differences.

Many firefighters view that their layflat firefighting hoses should be simply bought cheaply and frequently replaced, without any need for detailed performance specifications, except for the burst pressure where the misconception is that the "higher the better" must be right. However, the best can give superb performance and reliability over 20-plus years, even when used frequently. Buying low quality fire hoses is usually nothing more than a false economy.

Hose as a lifeline

Why do we treat our fire hoses as cheap commodities, and is that thinking responsible for those using and trusting these products in life-risking situations? Our firefighters, especially the nozzle operators are potentially at most risk in the face of the fire, by actually fighting it; containing it; preventing further destruction; and most importantly saving lives.

We should see fire hoses as a critical lifeline or umbilical cord, not only keeping our firefighters safe at the end of the line, but also rescuing those in need.

Why fire hoses fail

Fire hose needs to do a tough and difficult job during fire fighting, but it also needs to be stored in immediate readiness for its next emergency. They have the potential to let the firefighter down. Challenges include: the sudden loss of pressure; reduced water flow; kinking; sudden cuts to jacket or cover; abrasion damage; chemical attack; substantial leaks; sudden bursts; and even insidious attack from ozone in the air during storage. However this is not the fault of the hose, as it is doing no more than performing within its design parameters.

Experience shows that hoses fail often as a consequence of using the wrong product for the job, or not having an adequately robust specification for the hazards they face during use.

Spend time choosing

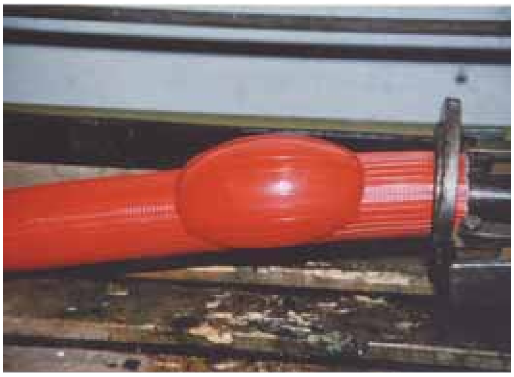
The choice of fire hose can make a huge difference to the performance, durability and reliability. It can save money over time, and provide outstanding reliability and durability if you select using a rigorous specification like the Australian Standard AS 2792 (Fire hose – Delivery layflat) or in conjunction with the internationally respected BS 6391:2009 (Specification for non-percolating layflat delivery hoses and hose assemblies for fire fighting purposes).

Firstly we have to understand the basics. Layflat fire hoses come in many different sizes and varieties, but there are two basic types:

- **Conventional textile hose with rubber lining:**

This has a woven jacket with the weave visible on the outside of the hose. These are usually white in colour and are generally used in low-risk applications such as: hose cabinets in light industrial areas; Class A hazards; some forestry and bushfire applications; and places where flammable liquids and chemicals are not generally used or stored.

Generally these white textile hoses are cheaper



Blistering can quickly lead to major hose damage. Pic courtesy of Kidde Australia

and more vulnerable to damage and attack. They often have high-stated initial burst pressures, but often get damaged quickly and usually need frequent replacement. They are vulnerable to acid and chemical attack to the crucial jacket fibres, which can lead to sudden failure during use. They also need drying after every use, which leads to larger stocking requirements, and are more vulnerable to lining damage and fungal attack.

- **Extruded or covered hoses:**

The feature of these hoses is that the woven jacket controlling the pressure is protected by an elastomeric or rubber lining and cover.

Some of these covered hoses are of a "sandwich" construction, where an external elastomeric cover and lining are glued on to the textile jacket. This helps make the hose more resistant to abrasion and water pick-up than the textile hoses. These "sandwich" hoses are generally used for low-to-medium risk applications like general industry, some surface mining and maritime applications.

However, extruded hoses are the most durable covered hoses. They have a more resilient construction, where the rubber lining and cover are extruded under pressure through the weave of the jacket to make a very tough, effective and durable fire hose.

Both "sandwich" and extruded types are usually red, yellow or orange. Because of the rubber cover these hoses do not need drying, just a wipe down after use, which is far more convenient and saves valuable time. Consequently reduced stocking is usually necessary.

However it is the extruded hoses that are generally used – or should be used – for all higher risk applications. These include situations where flammable liquids and chemicals are used or stored, and where a fire would quickly escalate to cause a serious incident. It certainly applies to virtually all professional firefighting users, particularly municipal fire departments, airports and heliports, oil refineries and chemical plants, offshore operations, bulk fuel and chemical storage terminals, military applications, power generation, together with higher risk sites where staff are trained for firefighting duties. Examples of this include transportation services such as car ferries, mines, oil and chemical pumping stations and pipelines, and drilling/storage or production vessels.

The best covered fire hoses are the extruded type, particularly when certified to AS 2792. These are the most durable, reliable, maintenance-free and easy to use fire hoses that also offer the best value for money. But there are plenty of these covered types that, depending on materials and construction, fall short and can suffer problems of kinking, cover damage and quite rapid degradation. This is generally more common with the "sandwich" type products.

Pitfalls to specifying hoses

Care needs to be taken when selecting fire hoses as looks can be deceptive. Let us focus on covered hoses, as they are the most widely used group. They all look similar, but consider the key practical factors of hose life to meet the firefighters' requirements of durability, reliability and cost-effectiveness.

- **Abrasion**

This measures the hose's ability to withstand general wear and tear. Any hose dragged across rough ground will suffer abrasion and, where the jacket is exposed, this will immediately begin damaging the fibres that contain the water pressure, and likely shorten the life of the hose.

Covered hoses are more abrasion resistant with their elastomeric cover over these jacket fibres, while "sandwich" hoses are inherently weaker than the most durable "through the weave" extruded type hoses. The composition of the elastomeric or rubber compounds also affects its flexibility and resistance to abrasion. AS 2792 has an abrasion test that requires a 64mm diameter extruded type hose to survive 90 abrasion double strokes of the test machine and a few are certified accordingly. Many covered fire hoses fail this tough test at around 50 cycles, yet they all look similar.

- **Lining damage**

The internal lining can be damaged by inadvertently dropping heavy objects like couplings on the hose when uncharged, or laying it on sharp objects that can puncture the lining once filled with water and pressurised.

Textile hoses have little protection from such impacts, and the resulting lining damage can cause leaks reducing water flow and pressure to the firefighter, or bursts making the hose unusable.

Such lining damage in "sandwich" type hose channels the water, under pressure, along the layers of the sandwich construction. This can strip or de-laminate the cover or lining off the hose jacket along the weaker glue line, holding it all together. Once this happens the hose is usually scrap.

Extruded hoses, on the other hand, are made of a much tougher construction, which also helps insulate the hose from impact damage. The solid pillars of rubber joining the lining to the cover through the jacket weave resist de-lamination. Blistering of the cover may occur with some brands, as water builds up within the hose construction, causing leaks or delayed burst.

One hose with over 20 million metres sold globally, and is renowned for withstanding such situations is Angus Fire's Duraline. Its rubber cover has latex plugged pinholes as part of the rubber curing process, making it exceptionally water and chemical resistant. Any lining damage will be relieved by popping out the minute latex plugs around the damage and identifying the spot, preventing further damage. Repair with a special rubber patch allows it to continue its duties unaffected and extends the life of the hose, providing outstanding value for money.

- **Heat ageing**

Hoses in any fire situations are likely to get hot from proximity to the fire, which can begin to weaken or even melt jacket fibres when they are exposed on the hose surface. The composition of the rubber cover can be crucial in protecting the hose from such radiation attack.

Several rubber-covered and textile hoses suffer rapid burst under such heat attack. Here the cover composition is all important. High nitrile content in the PVC provides excellent heat resistance. Only the toughest hose standards include a test using a metal cube at 600°C placed on a pressurised hose and timed until it melts through the cover/jacket causing burst. As you would expect, only the best extruded type hoses can withstand this stress, as the special rubber composition chars, raising the hot cube above the hose surface, insulating it from further damage and allowing water pressure to be maintained without bursting.

- **Flexibility and kinking**

While hoses are often used at substantial water pressures, frequently pressures are limited and many hoses will kink below about 5 bar water pressure. This can cause severe or dangerous flow restrictions – even the total water loss to the firefighter at the other end.

Kinking also causes raised points where rapid local damage occurs. Dragging a kinked hose can quickly wear a hole through the charged hose causing it to burst. Again special hose construction overcomes these common problems, where an all-nylon jacket provides the flexibility and stretch necessary within jacket fibres, to prevent the hose kinking between 3 bar and 5 bar pressure. This is easily tested by charging the hose to 5 bar water pressure while curved around a 200 litre drum; it should not kink. This performance level is still only found in the best extruded hoses, yet is a crucial requirement for any high-performance hose specification, to protect firefighters from sudden flow fluctuations, pressure reductions and potential burst that could all put their safety at risk.

- **Moisture absorption and chemical attack**

Exposed jackets easily pick up moisture and chemicals that can shorten life expectancy by quickly weakening the fibres, leading to unexpected bursts when the hose is next used. A "sandwich" rubber composition will tend to absorb water/chemicals over time and allow deteriorating attack. Many extruded hoses have minute pinholes in the outer rubber cover to allow volatile gases to escape during the manufacturing process. These can permit water and chemical ingress to weaken the jacket fibres over time, reducing their capacity to contain operational water pressures during use. This can lead to sudden failure during operation, putting the safety of firefighters at risk. Again citing Angus Fire's Duraline as an example, this hose has overcome this difficult problem with pinholes filled with latex plugs that prevent water or chemical ingress, so extending the reliability, working life and durability of the hose.

- **Ozone attack during storage**

Perhaps if the fire hoses are little used they will be safe from these assaults? Regrettably this is not usually the case.

Many elastomeric and rubber compounds are vulnerable to attack by ozone, a highly volatile atmospheric component. It occurs most frequently in areas of strong sunlight and causes cracking of many elastomeric compounds, particularly along stress lines, such as folds in layflat hoses. This adversely affects the lining and cover of fire hoses, unless the rubber compounds have special ozone quenching agents and a high nitrile composition. Selecting a certified AS 2792 extruded fire hose will ensure that it exceeds all the requirements for the particular application. Each length is individually pressure tested to 22.5 bar before factory despatch to verify its performance, long term durability and cost-effectiveness.

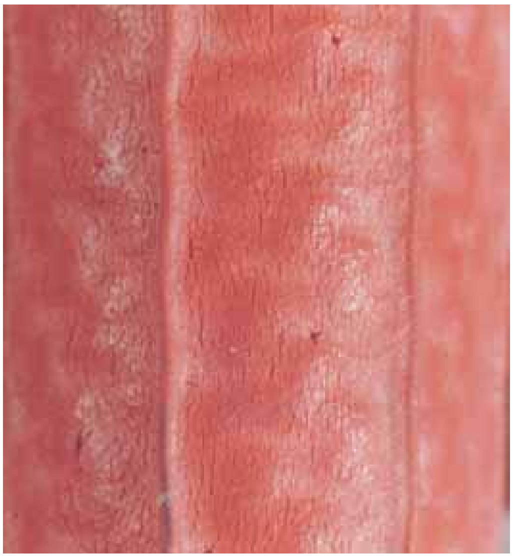
Angus Fire's Duraline fire hose is certified to AS 2792 and kitemarked to BS 6391. Pic courtesy of Kidde Australia

Firefighter safety is critical

As we have seen, textile and covered "sandwich" type hoses can be suitable for low-to-medium risk applications, but increasingly operators are beginning to appreciate the critical nature of fire hoses in emergency response plans.

Many are now considering upgrading to a certified extruded fire hose that has the potential capability for firefighter protection in high risk situations, like those faced by municipal fire brigades, civil aviation ARFF (Airport Rescue and Firefighting) teams, industrial fire departments and military firefighters. Many are now realising that only an AS 2792 certified hose will provide the consistent quality, safety, security and durability required to verify this capability and support and protect fire fighters, and those they may be helping to save. **APF**

For further information, go to www.kidde.com.au



Ozone cracking on extruded hose. Pic courtesy of Kidde Australia

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Graham Collins

Planned Protection

Planning for fire safety should start at the earliest design concept stage, where the focus of attention should be on prevention and containment of a fire.

Traditionally, buildings were not constructed with any consideration being given to fire safety. In fact, this lack of awareness or concern did not apply just to individual buildings; it covered every aspect of the built environment.

So, in addition to the particular building being designed and constructed with scant attention being paid to fire safety, the proximity of buildings one to another, combined with narrow and inaccessible streets meant that an individual blaze often became a neighbourhood or even city-wide conflagration. History is littered with examples; perhaps the best known is the Fire of London in England in 1666 that consumed 13,200 houses, 87 parish churches, the original St. Paul's Cathedral, and destroyed the homes of 70,000 of the City's 80,000 inhabitants.

Thankfully, many countries – although by no means all – have progressed from the design and construction philosophy that a building needs to provide only protection from the elements and security for the contents. Today, architects and legislators formulating codes and standards are aware that fire safety starts with the structure itself and buildings are being designed that incorporate fire resistant materials and other passive measures to ensure containment of the fire, and pay proper attention to the safe evacuation of inhabitants.

The growth of the science of fire engineering has played a major role in improving fire safety

and, increasingly, the fire safety engineer is a key member of the design team. This has resulted in the development of alternative building solutions and a far greater awareness of the way in which fire and smoke spreads and develops and the impact this has on occupant survival and evacuation. The more widespread adoption of fire engineering techniques at the building design stage has brought about greater design flexibility – as is evidenced by the many iconic buildings punctuating city skyscapes around the world – innovative use of construction techniques and materials and enhanced fire safety.

To an increasing extent, prescriptive codes and standards have been replaced by the adoption of fire engineering inspired "performance-based design" that considers fire safety from a "whole building" perspective.

While remedial work can often be undertaken to improve the passive fire safety of a structure, it is a task that should be seen as an essential part of the initial building design process. Advances in recent years in fire detection and alarm technology and fire suppression systems have had a major positive impact on fire safety, but they should not need to be adopted as a post-applied solution for a building where insufficient attention has been paid to fire safety at the design stage. They should be part of an holistic solution to the fire safety challenge.

Fire safety landscape

Until comparatively recently, buildings were designed and built to comply with prescriptive codes and standards. These were understood by construction professionals, were relatively easy to apply and equally easy to enforce by building control authorities.

To an increasing extent, this time-honoured procedure has been replaced by the adoption of fire engineering inspired "performance-based design" that considers fire safety from a "whole building" perspective. This is an approach to fire protection based on three activities. The first is clearly establishing the fire safety objectives for a particular building. This may be life safety, property protection, business continuity, environmental impact or, most frequently, a mixture of these objectives. This is followed by a detailed analysis of the possible fire scenarios for that building; descriptions of the types of fires from which the design is intended to provide protection. The final step is a professional assessment of the design alternatives compared with the fire safety objectives. This is followed by the selection of design strategies.

Across the world, buildings seem to be increasingly subjected to natural hazards such as cyclones, hurricanes and typhoons, massive flooding and mud slides, earthquakes, and wildfires and bushfires. Not all result immediately in fire, but fire is a significant outcome for many so, while they remain unpredictable, the building designer needs to take them into account during the initial design stage. This is perhaps particularly so in the case of wildfires and bushfires.

Type of construction

The type of construction adopted by the architect will have a significant bearing on the fire safety characteristics of the building, and the way in which it performs in a fire.

Steel framed buildings that have floors, roof and walls of a building attached to the steel fame need to be protected from fire. This is because steel softens at high temperatures and this can cause the building to partially, and ultimately totally, collapse. In practice, this protection usually takes the form of spray-on fireproofing or fire resistant cladding. Concrete, on the other hand, can endure fire for a long time without losing its structural integrity. Its thickness and lack of ductility can contribute towards keeping a fire from becoming worse. Thick concrete walls are able to withstand very high temperatures without deforming or cracking.

Although timber is a combustible material, it is a good insulator and burns in a predictable fashion. When timber is exposed to high temperatures it will decompose, providing an insulating layer of char that retards further degradation of the wood. The rate of char is initially fast, but as the char increases it slows as this insulating layer grows. This behaviour is used to predict timber char rates for large cross-section timber sections.

Inside the box

The idea behind compartmentalisation is to subdivide a building into separate fire compartments, to contain the fire, smoke and gases within that area to provide the necessary time for people in adjoining parts of the building to escape and limit the collateral damage caused by the fire. This compartmentalisation must achieve a certain fire-resistance rating and may, in certain buildings, enable operations to continue in unaffected parts of the building. Depending on the building, a compartment may be a single room or a number of rooms.

In some buildings, special evacuation needs may be the deciding factor that determines how and where it is compartmentalised. Hospitals are a case in point, where compartmentalisation may be essential to facilitate horizontal evacuation of bed-ridden or highly-dependant patients. In these cases the building designer may have to devise a compartmentation solution that enables phased compartment by compartment horizontal evacuation within the building prior to vertical evacuation of the building.

It is impossible to overemphasis the importance of maintaining the integrity of compartments and it is essential that supervising architects, project managers and contract managers pay particular attention to ensuring that the fire resistance is maintained when perforations are made in compartments for ducts or pipes. Under no circumstances should these compartments – in some countries called fire walls – be breached and where it is essential to perforate a compartment the fire resistance must be retained by using correctly certified collars around service pipes, infilling voids or fitting intumescing material.

Designed-in evacuation

Building occupants, both permanent employees and visitors, with disabilities that impair their movement or sight must be considered at the design stage, particularly if the building is a high-rise structure.

The design of the building may incorporate lifts that can remain in use during the evacuation period. However, a standard passenger lift is not fit for this purpose, although there is some scope to install lifts with certain safety features that allow them to be operated in an emergency under management control using an override switch to carry out the rescue of people from refuges.

However, the capacity of these escape lifts is unlikely to be enough to accommodate all of the building's occupants that require evacuation by lift at any one time, so adequate areas of safe refuge should be provided to accommodate those awaiting evacuation.

This will call for the construction of fire-resistant refuges on each floor to provide a safe shelter for anyone who is unable to leave the building. These refuges must be able to accommodate a wheelchair without impeding the safe evacuation of able-bodied occupants, and have emergency communication – accessible for a person in a wheelchair – that is linked to the main fire control point in the building.

Limiting internal spread of fire

Limiting the spread of fire across the walls, partitions and ceilings of a building is another consideration for the building designer, affecting the architect's choice of wall and ceiling coverings and paints. Materials are available that are termed "fire resistant" that discourage the spread of flames while those that are designated "fireproof" literally will not burn. The term "flameproof" is used in some parts of the word as a synonym for "fireproof".

Equally important is the rate at which flame will spread over a surface. Although the linings of a building are rarely the first material to be ignited in a fire – this is usually furniture and fittings – they can affect significantly the spread of the fire and its rate of growth. This is particularly important in circulation areas, where rapid fire spread may prevent building occupants from escaping.

Being prepared

Not that the building design team's attention should be focused on the passive fire prevention measures. Another area that must be addressed, again at the earliest concept stage, is access for the emergency services.

The designer should always bear in mind the need to achieve the least complicated layouts to enable firefighters to locate an area quickly and with the least number of obstacles or hazards. At the same time, firefighters need to be assured of rapid and unhindered access to hose valves, elevators and stairs, annunciators, voice evacuation and public address panels and key boxes. Last but not least, attention must be paid to providing adequate access for firefighting vehicles to the site and around the building or buildings. APF

It is impossible to overemphasis the importance of maintaining the integrity of compartments and it is essential that particular attention is paid to ensuring that the required fire resistance is maintained.

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Dealer/Distributor

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Email: sp@sp-associates.co.th
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Website: www.aptes.com.vn
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LACVIET TECHNICAL SCIENTIFITIC & ELECTRIC CO LTD
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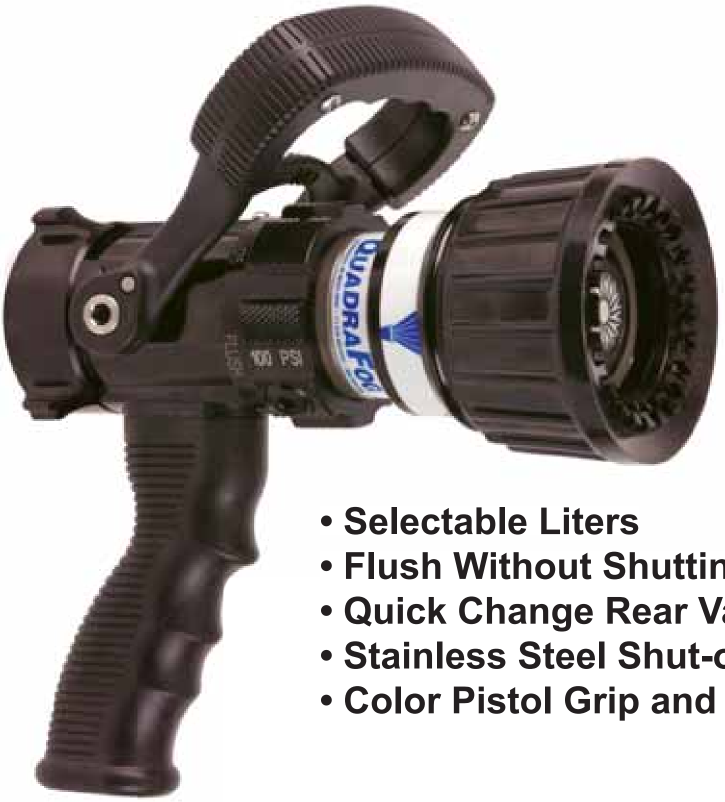

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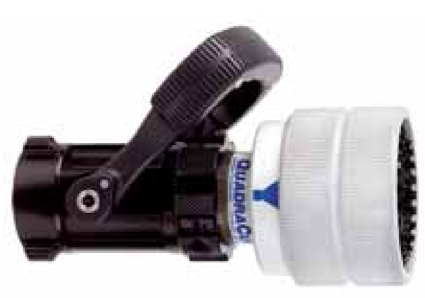

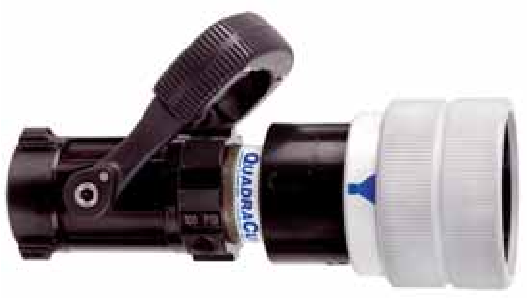

The TFT QuadraCup is a rugged and dependable selectable gallonage nozzle with a retractable foam aspiration sleeve. When the outer sleeve is in the retracted position, the nozzle operates the same as the TFT QuadraFog. Flow can be set to any one of four settings, or to a flush mode. The front end can be rotated from straight stream through wide fog patterns. Uniquely cut fixed metal fog teeth produce a wide range of fog patterns. Available in either tip-only configuration or with a stainless ball shutoff, the QuadraCup is also available with optional colored pistol grip and handle covers (NFPA 1901 (A.16.9.1).

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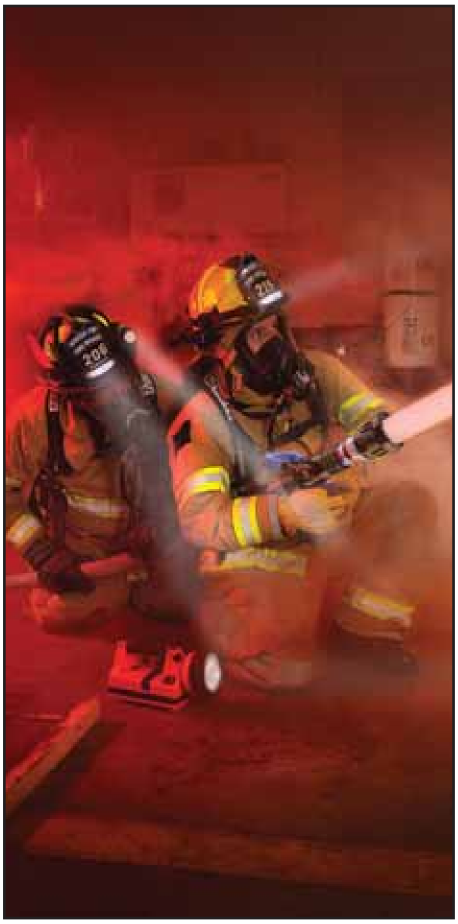

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Dynax Product	Ionic Type	Agent Application Guide			
		AFFF	AR-AFFF	FFFP	AR-FFFP
Fluorosurfactants					
DX1030	Anionic	●	●	–	–
DX1040	Anionic	●	●	–	–
DX1080	Nonionic	●	●	●	●
DX1090	Nonionic	●	●	●	●
DX1025*	Anionic	●	●	–	–
DX1026*	Anionic	●	●	●	●
Foam Stabilizers					
DX5022	Anionic	–	●	–	●
DX5065**	Anionic	–	●	–	–
DX5066**	Anionic	–	●	–	●

* Blend of Fluorosurfactants ** Blend of Fluorosurfactants and Foam Stabilizers

US EPA PFOA Stewardship Program

By 2010: 95% Reduction of facility emissions and product content level of PFOA, precursor chemicals that can break down to PFOA and related higher homolog chemicals.

By 2015: Elimination of PFOA, PFOA precursors and related higher homologue chemicals from emission and products.

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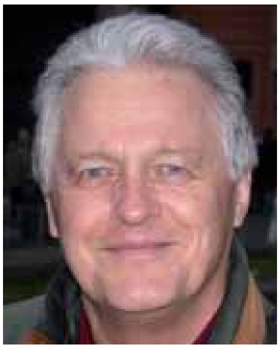

Paying the Price

By Graham Collins

It seems that every editorial I write for Asia Pacific Fire at least makes mention of one disaster or another. Sadly, this time around is no different, with the earthquake and tsunami that struck north-east Japan just after the March/April edition of the magazine had gone to press.

Nuclear disasters must be the fire and rescue fraternity's worst nightmare; certainly the most arduous, life-threatening and, as the Fukushima Daiichi nuclear plant demonstrates, the longest lasting. Here we are, nearly three months after the event, and operations are still continuing.

This has understandably raised questions once again about the safety of these plants and the adequacy of the firefighting and emergency response measures that are in place in nuclear plants around the world. There are 442 nuclear plants worldwide producing 14 percent of the world's electricity. This compares with a believed tally of around 50,000 coal-fired power stations producing 41 percent of the world's electricity. So the value of these plants in terms of output per station is evident. But following Chernobyl and Fukushima, can they ever be made safe environments?

For what the Fukushima disaster cost you could buy a lot of cutting edge personal protection equipment, pay a lot of firefighters' salaries and buys the best available talent and equipment.

Since the earthquake and tsunami struck I have spoken with a number of companies and organisations directly involved in nuclear plant safety and have been left with two clear messages. The first is that safety at these plants is about passive measures; in other words, making sure that they are constructed to be as uncompromisingly structurally robust and fire resistant as is humanly possible. The second is that in a major emergency such as Chernobyl or Fukushima, it is more about emergency preparedness and disaster recovery than it is about fire detectors, alarms and conventional firefighting.

This is not to suggest that prudent fire protection and firefighting measures should not be in place; rather, it is to acknowledge the very nature, severity and instant devastation that a major nuclear plant explosion causes.

Building nuclear power stations that will withstand high-impact disasters is something that experts from the International Atomic Energy Agency's current mission to Japan will no doubt have front-of-mind when preparing its report for the subsequent Ministerial Conference on Nuclear Safety at the IAEA headquarters in Vienna. The television footage of the disaster and the now desolate and abandoned townships near the Fukushima plant is also sure to focus the minds of those responsible for drawing up response plans, evacuation plans, and establishing manpower and resource requirements in areas close to each of the world's 442 nuclear plants.

This latter activity will inevitably mean reviewing fire and rescue operations at the highest level; reassessing training needs, staffing levels and equipment availability, as fast, highly mobile and appropriate response is essential. Cooperation between all of a country's emergency services may have to be re-honed and expanded to embrace the armed services and civilian contractors and suppliers.

Sound expensive? No doubt. But before the penny-pinching starts, just bear in mind the estimated cost of the Fukushima disaster. It currently stands at more than US$ 300 billion. And that buys a lot of cutting edge personal protection equipment, pays a lot of firefighters' salaries and buys the best available talent and equipment. **APF**

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Foreword

Privately Developed Codes and Standards

James M. Shannon

NFPA

Protecting our independence as a codes and standards development organisation is one of the most important issues we face at NFPA today. There are those who argue that all codes and standards should be classified as public domain material without access to copyright protection. If that argument prevails, it will destroy the independent source of revenue that organisations such as NFPA need to undertake the crucial safety standards development process. Private-sector code developers would be forced to rely more directly on affected interests for financial support, which would undermine their impartiality and independence.

One aspect of private-sector standards development that public officials should better understand is the measure of independence provided by the methods we use to finance our operations. We pay for our technical and administrative staffs, as well as our code-development costs and overhead, by selling codes, standards, and other related documents. We support and underwrite many programs, such as gratis code training for authorities having jurisdiction and our public education activities. We are not funded through charitable contributions or government grants, or by license fees paid by the jurisdictions that use our codes.

Anyone who has been involved in the NFPA process knows how much local, state, federal and international agencies rely on our codes and standards to protect the public from fire and other hazards.

More importantly, we are not a trade or industry association. Affected industries are welcome to participate in our process along with enforcers, academics, consumers and other interested parties; but they do not underwrite the process. Deriving revenues from copyrights protects our independence. No one can influence us by threatening to withhold funds. I doubt that government agencies would feel comfortable for very long relying on a system where independence has been so compromised. Such a scenario would require jurisdictions to bear more of the burden and cost of code development, lowering the level of standardisation we enjoy today.

Anyone who has been involved in the NFPA process knows how much local, state, federal and international agencies rely on our codes and standards to protect the public from fire and other hazards. Government officials from all over the world have confidence in us because we bring together such a broad range of expertise to tackle difficult technical public safety questions; and they know that our process is fair, inclusive, balanced, and transparent. I have attended technical sessions at our annual meetings for 20 years, and I am still struck by the depth of knowledge among those who attend those sessions and their commitment to working through the NFPA system to enhance safety.

The most remarkable aspect of this process is that all of this work, which is done on behalf of the public and enthusiastically adopted by government, takes place under the auspices of a private international organisation. Long before any notion of "public–private partnership" took root, the idea of public authorities adopting codes and standards developed by private organisations was widely accepted. This system has been in place for more than 100 years because it makes good sense.

At our technical session this year, I will again be reminded of the unique partnership between the private and public sectors that the NFPA process represents and of how much NFPA has done over the years to protect the people. I will be proud, once again, of our reputation for fairness and impartiality. And, most important, I will think about how critical it is that we do everything we can to protect the system that serves the public so well. APF

James M. Shannon is President and CEO of the NFPA

For further information, go to www.nfpa.org

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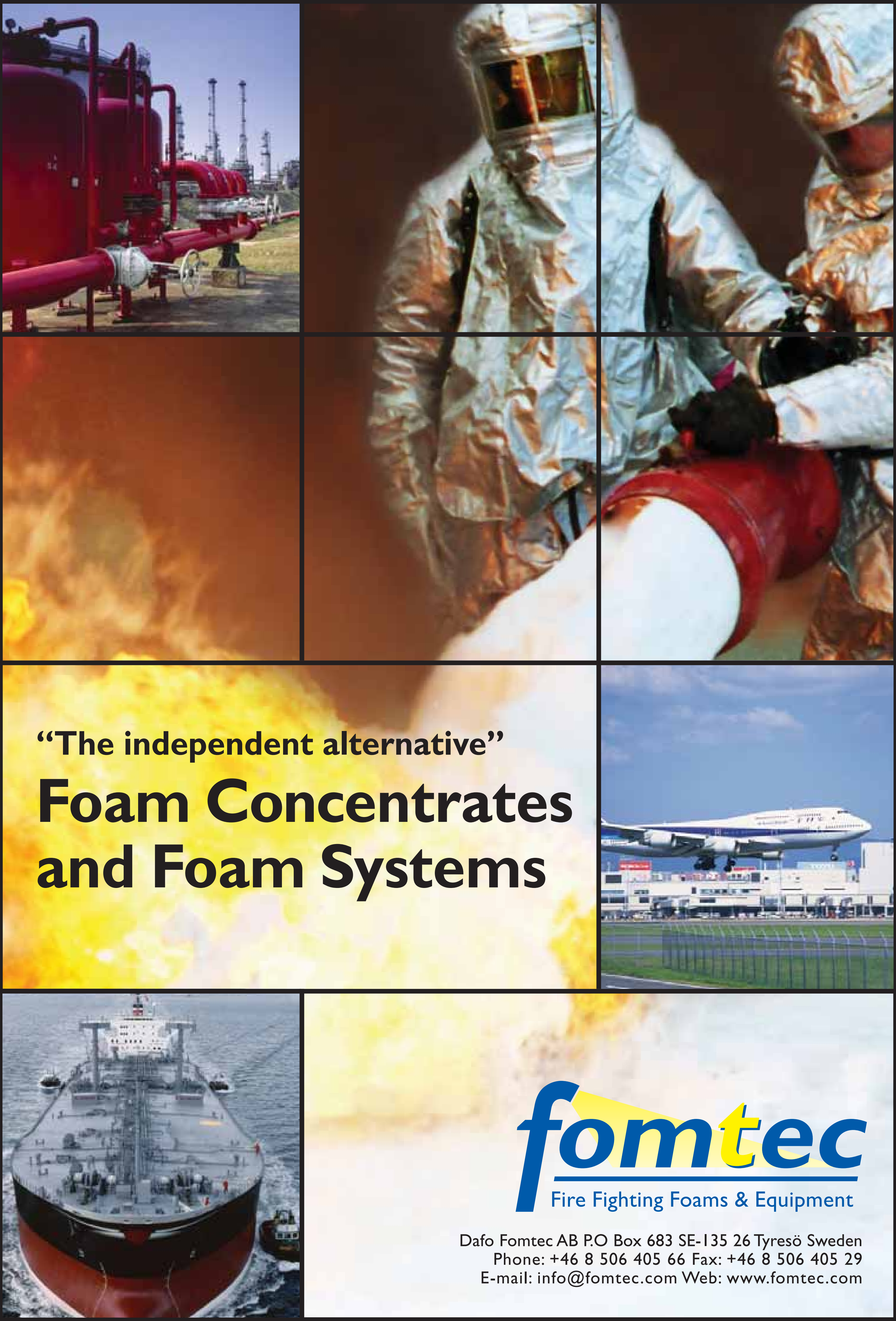

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New Sounder Range

VIMPEX has launched Banshee Excel, a family of sounders, strobes, sounder strobes and accessories that, the company says "represents the most modern, acoustically advanced and by far the most versatile range of conventional electronic sounders, combined units and dedicated strobes available on the market."

All sounders, apart from the bedroom sounder, come with 32 user-selectable tones incorporating low and high frequencies, European, American and Australian norms and all industry-standard frequency patterns. Tested and approved to EN 54 Part 3, the Banshee Excel range boasts leading acoustics, aesthetically pleasing designs and low power consumption.

The Banshee Excel sounders use the same simple push and twist bayonet mounting base with locking screw as the BansheeMT range, which they are replacing. This enables backwards compatibility for existing installations and ensures a smooth transition for Fire companies already using Banshee products. The Banshee Excel Lite sounder strobe units offer all the functionality of the Banshee Excel sounders, together with either Xenon or LED strobe technology and several different coloured lenses to enhance the evacuation signal.

The Banshee Excel FlashDome stand-alone strobe is aimed at fire alarm systems that need to be upgraded or designed for conformity to disabled access requirements. The range is completed with the bedroom sounder for fire applications in hotels and residential environments.

For further information, go to www.vimpex.co.uk

High Output Warning Beacon

The latest version of its L101 family of physically compact 86mm by 86mm beacons, the L101H, has been announced by E2S, manufacturer of audible and visual warning devices. Featuring an array of 24 high-output LEDs as the light source, the robust L101H is being promoted as being "ideal for fire, security, industrial control and general signalling applications".

The unit is available with or without mounting lugs, it can be stacked to create multi-signal arrays, and can be used in conjunction with the company's SONFL1 and the A100 sounders to make combined audible-visual warning devices. Steady or flashing output is a user-selectable onboard option.

Available with amber, blue, green, red and white LED arrays, all versions have a clear lens to maximise output, enabling the units to provide an effective signal when installed in high ambient light areas; the white unit has a luminous intensity of 120 candela. The devices are powered from either 10 – 30 VDC or 90 – 260 VAC/DC. The housings are moulded in either RAL 7038 grey, RAL 3000 red or white flame-retardant ABS, and the units are sealed to IP66, enabling them to be installed in harsh environments.

For further information, go to www.e-2-s.com

Indian Deal for Comms Company

TETRA digital radios company, SEPURA, has signed a major new channel partnership agreement with Raxa Security Services Limited, a subsidiary of the leading Indian infrastructure and services operator, GMR Group.

The deal is said to reflect the huge potential for TETRA systems in India, as a result of increasing public and private sector investment in infrastructure across the country. GMR Group's core business is the delivery and operation of infrastructure projects, including Delhi and Hyderabad airports, together with numerous road, power generation and Special Economic Zone schemes. All of these projects require modern IT and communications infrastructures to ensure secure and safe operating environments.

For more information, go to www.sepura.com

New Thinking at Sydney Conference

More than 1200 delegates are expected in Sydney in late August for the eighth AFAC-BUSHFIRE CRC ANNUAL CONFERENCE, combined with this year's largest emergency services sector trade expo in the Southern Hemisphere.

Keynote speakers are confirmed from Europe and the USA. They will be supported by Australian and internationally recognised experts and researchers in what has grown to be the pre-eminent knowledge sharing event for the fire and emergency service sector in Australasia. Its trade show will feature more than 100 exhibitors occupying more than 7,000 square metres of floor space.

The theme of the conference is "New World, New Thinking," which is fitting given the scale of cyclones, floods, earthquakes and other natural disasters around the globe this year. The conference is at the Sydney Convention and Exhibition Centre, Darling Harbour, from Monday 29th August to Thursday 1st September.

For further information, go to www.afac2011.org

Indian High-rise Cost Savings

A fire detection and alarm solution that was a combination of addressable and conventional technologies has been supplied by FIKE SAFETY TECHNOLOGY for eight, thirteen-floor tower blocks in Faridabad in the south-east of Haryana state in northern India.

The solution is claimed to have shown significant installation cost savings and reduced complexity when compared with an original plan to install a solution based on conventional technology. For example, the original proposal called for more than 50,000 metres of cable, whereas the Fike scheme reduced this by 70 percent to 15,000 metres.

The project uses addressable detectors throughout for greater flexibility than was possible with the conventional non-addressable proposal. The Fike addressable detectors have integral facilities for the connection of digital input signals from external devices. This enables connection of up to five call points to each detector, eliminating the need for separate input/output modules and significantly reducing the amount of wiring associated with the call points. Where necessary detectors with a built-in sounder were used, eliminating the cost of separate sounders and the time needed to fit and wire them.

For further information, go to www.fike.com/corporate/subukfst.asp

New LED Scene Light

A new high-power LED scene light that is claimed to deliver superior light distribution evenly across an entire emergency scene, creating a safe work environment, has been launched by AKRON BRASS as part of its Extenda-Lite range of products.

The new SceneStar's highly-engineered reflector and electronics produces a brighter white light using less power than traditional quartz halogen lamps. This increases work area visibility as well as enhancing the illumination of distant objects. Utilising the latest LED technology, the SceneStar is heralded as being "a combination of performance, durability, efficiency and style".

It features long-life LED (50,000+ hours), optimised thermal management, and a six-year warranty. Akron Brass says that no other LED scene light provides such industry-leading levels of light with consistency and reliability.

For further information, go to www.akronbrass.com/scenestar

Foam Manufacturer Acquisition

SOLBERG SCANDINAVIAN AS, one of the largest independent firefighting foam agent manufacturers in Europe, has been acquired by Amerex, a manufacture of hand-held portable extinguishers and fixed special-hazard fire suppression systems.

The acquisition is described by the company as enabling Amerex to bring advanced, environmentally-sustainable firefighting foam technology to the Americas, and will give it a global presence as a full-line manufacturer serving the fire protection and firefighting industry.

Solberg is based in Bergen, Norway, and has been involved in the manufacture of firefighting foams since the 1980s. The company is recognised throughout Europe and the Asia Pacific Region for its environmentally-sustainable fluorosurfactant and fluoropolymer-free Class B firefighting foam. Solberg also manufactures a complete range of traditional Class B synthetic aqueous film forming foams (AFFF) and alcohol resistant concentrates (ARC), as well as USA Forest Service approved Class A and high-expansion concentrates. It has a significant market share in northern Europe and Australia, where its technology is well established in the aviation, petroleum, oil and gas markets.

According to the acquisition announcement, Solberg will continue to operate as an autonomous business. In addition to firefighting concentrates, the Solberg offering will include standard and customised foam suppression systems, hardware and accessories. Solberg customers will continue to purchase Solberg firefighting foam through the existing distributor network.

For more information, go to www.solbergfoams.com

Protecting Darwin's Specimens

A KIDDE Hi-Fog watermist system is being installed in the specimen store of the art gallery at the Museum and Art Gallery of the Northern Territory (MAGNT) in Darwin, Australia. The store was previously protected by a nitrogen-powered foam deluge system, but the cost of clean-up and servicing the equipment led to the decision to upgrade to the Marioff-manufactured watermist system.

The specimen store uses ethanol as a preservative and, since ethanol is a highly flammable liquid, any fire started in the storeroom would have the potential to get out of control very quickly and cause extreme damage to people and property. It is being protected by a high pressure pump unit using 35 spray nozzles. The distribution pipe work and fittings are stainless steel.

Set in a tropical garden on Darwin Harbour at Bullocky Point, MAGNT is the Northern Territory's premier cultural institution. The complex comprises five major permanent galleries, a touring gallery, educational facilities for school groups, a theatre, a museum shop and a museum cafe. All contribute to providing an entertaining, diverse and educational experience for the local community and visitors.

For further information, go to www.kidde.com.au

The reasons why your Safety Helmet should carry the AS4067 Label

Comparing Safety Standards for Fire Helmets is akin to saying Aussie Rules and Rugby Union is the same game simply because the balls are the same shape!

Consequently, there is frequent confusion about which Standard is best and claims are often made without considering all the evidence. It should be remembered that the three-principle international structural fire helmet Standards come from three completely different parts of the globe, the USA, Europe and Australia/NZ – each with its own operational practices and perspectives.

The Australia/NZ standard for structural fire helmets, AS/NZS 4067, has been created by a committee of interested representatives having specific consideration for helmet styles, operational risk and the environment applicable in these two countries. Some of these factors include ambient temperatures in summer, a high incidence of motor vehicle accidents, USAR aftermath and other cleanup responsibilities. The actual time spent fighting structural fires commonly constitutes only 10% of the time a helmet is worn. The Committee has also taken into account test performances in the other Standards documents, some of which it considered either too lenient or, conversely, too extreme.

Finally, to protect our firefighting crews, it is important that the Standard for Australia and New Zealand is developed and maintained because our fire scenes can be quite different from those in other countries/regions.

There are a number of performance requirements in AS/NZS4067: 2011 that make helmets certified to this standard stand out as being special and indeed superior when compared liketo-like with other international structural fire fighting helmets.

- **Flammability Resistance Test** This is a special test found only in AS4067. The helmet shell is subjected to a 200°C radiant heat source for 60 seconds. This is followed immediately by subjecting the shell to a Bunsen burner flame for 15 seconds, while the radiant heat continues.
- **Convective Oven Heat Test** In addition to the test above, an AS4067 certified helmet has to be able to retain its shape and not melt or drip after being exposed to heat at 230°C for 3 minutes.
- **Durability Test** This is a unique preconditioning test that is given to the helmet shell, prior to any shock impact tests. The helmet is dropped from a height of 1.5m onto a flat concrete surface twice, effectively "softening" the shell surfaces, especially the crown area, and therefore affects the shock impact reading in a negative way if the shell integrity is compromised.
- **Shock Impact Test** Other standards only test helmets to the top 30 degrees from the centre crown. AS4067 helmets are tested over a much wider area of the helmet, down to as far as 60 degrees from the centre line. This provides not just top impact but also side, front and rear impact in the event of other types of potential injury including falling from a ladder or through a building, or being involved in a vehicle accident, the leading cause of fatalities in Australia/New Zealand.
- **Electrical Insulation Test** The tests conducted on AS4067 certified helmets are far more severe than any other international Standard. The voltage applied to the helmet, (be it conductive helmet test or wet shell test), is a deadly 2,200V and the duration is as long as 1 minute. Tests in other standards use only 1,200V for duration of just 15s.
- **Internal Temperature Rise Test** If you think fighting a large structural fire is hot work imagine if while fighting this fire the inside temperature of your helmet rose 25°C, because that is the temperature rise permitted in other standards. AS4067 allows a maximum temperature increase of only 10°C. In our full liner, multi-layer helmets, the temperature increase is less than 3°C.

The Other Benefits of Wearing AS/NZS 4067 helmets, that simply comparing Standards won't tell you

- **Lighter weight** Our AS 4067 helmets weigh 20-30% less than EN443 models.
- **Helmet Styles** Pacific Helmets offer 4 different styles of helmets, each with a variety of features and options, all certified to AS 4067.
- **Comfort and Safety** We believe your comfort and safety are paramount.
- **Head Size Range** Pacific Helmets are deliberately designed for the widest range of head shapes and circumferences between 52-64cm, and even head circumferences of 64-65cm can be accommodated in some models.
- **Design options and Brigade Customization** We specialize in offering brigades unique designs and customization to meet individual brigade expectations.
- **Metabolic Heat Dissipation** Comparative model-by-model tests show Pacific Helmets provide unparalleled levels of heat dissipation, even in high ambient temperatures.
- **Full Cranial Head Protection** All helmets incorporate a full impact liner for all-round safety. Few European helmets offer full impact protection to the wearer's head.
- **No Compromise on the Materials Used** We make no compromises in searching the world for the best safety materials in our helmets, and the performance of our helmets is constantly under review and revision.
- **Confidence in the AS/NZS 4067 Standard** You can be certain that the people of the SF49 Standards Committee (representing a wide range of expertise and experience in Australian/NZ conditions), have your safety as #1! APF

For more information go to
www.pacifichelmets.com

New LUKAS Power Units: Power for four

Your wish was our command: the new P 650 motor pump series provides what fire fighters really want. Our engineers listened very carefully to interviews with fire fighters all over the world and have developed a power unit that meets their demands even better. P650 4Power is the first gasoline power unit with enough hydraulic power to operate up to four rescue tools at the same time.

With turbo function

Rescue at twice the speed! Every second counts in rescue operations, which is why LUKAS has provided its P 650 series with a turbo function. With one hand movement you can double the oil flow to one tool in order to work twice as fast. This feature is particularly valuable for operating rescue rams that call for a large volume of oil.

Technical Data

Engine	4-stroke gasoline	4-stroke gasoline
Connection	4 tools	4 tools
Operation	4 tools	4 tools
Turbo function	2 x Turbo included	2 x Turbo included
Power	5.1 kW	5,1 kW
Electric starter[1]	Electric starter included	Electric starter included
Max. operating pressure	10,150 psi	700 bar
Flow rate low pressure – high pressure	4 x 156-4 x 43 cu.in./min	4 x 2,55-4 x 0,7 l/min
Flow rate turbo low pressure – high pressure	2 x 305-5 x 85 cu.in./min	2 x 5-2 x 1,4 l/min
Usable oil quantity	293 cu. in.	4,8 l
Dimensions l x w x h	19.1 x 17.3 x 17.5 in.	485 x 440 x 445 mm
Weight[3]	108 lbs	49 kg

[1] optional without electric starter (weight: 96 lbs/43.5 kg)

Facts

- Four times full power
- Faster rescue operations using the turbo function
- Power unit: gasoline engine
- Valves: 4Power, simultaneous operation of four tools
- Two valves each can be combined in turbo mode
- You can either operate two tools at the same time using turbo mode
- Or one tool in turbo mode and two tools in normal mode
- Ideal for major accidents – enabling you to work on several vehicles at once
- Enormous power in any load range with sufficient reserves
- No additional space needed: same dimensions as Simo Power (operation of two tools)

Convenient operation

- All valves accessible from the front
- Large and well-labeled controls
- Optimally designed for operation with gloves
- Tank levels visible from outside

More power

- High-performance engines develop enormous power in any load range
- Always plenty of power in reserve

The new LUKAS P 650 4Power Units are also available with 787 in./ 20 m double hose reel and two additional couplers for hose connection.

For further information, go to www.fike.com/corporate/subukfst.asp

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Sliding Systems Collaboration

Multidrive Technology, the Australian manufacturer of heavy duty, all terrain, multi-drive vehicles, has concluded a collaboration deal with Integrated Equipment, the sole distributor in south-east Asia of CHAMBRELAN heavy duty sliding systems.

These specialised lightweight custom built trailers built by Multidrive are widely used by the emergency services and are also used extensively in a support role for command and control applications. Tailor made, these trailers are a dual axle trailer, and are packed with tool boards and storage and compartments, held in place by the Chambrelan heavy-duty slides.

For further information, go to www.chambrelan.co.uk

New Australian Watermist Standard

STANDARDS AUSTRALIA has published a new Australian Standard, AS 4825-2011 Tunnel Fire Safety, in response to the increasing number of road tunnels being built in Australia. Significantly, this new standard recognises watermist systems as a legitimate option to conventional sprinkler or deluge systems. While conventional tunnel sprinkler and deluge systems have typically been designed on the basis of historically derived water application densities rather than tunnel specific fire test programs, the effectiveness and performance of watermist systems in tunnel applications is documented and proven in full scale tunnel fire tests.

For further information, go to www.standards.org.au

Thermal Imagers – Vital Tools for S & R

Among the many benefits to using a thermal imager is improved firefighter safety; when visibility is restored, safety is dramatically increased.

Thermal imagers allow firefighters to see through thick smoke, which greatly reduces search times and improves the odds of quickly finding and rescuing trapped victims. Accountability is also improved when using a thermal imager because firefighters are able to see one another.

There are a wide variety of thermal imagers available for fire departments – from advanced thermal imagers with ultra-high resolution detectors, advanced colourisation, enhanced image clarity and picture definition, to low-cost, lightweight, navigational personal-issue imagers that clip to a firefighter's gear. Either way, they have become a necessary tool for fire departments.

Firefighter safety

Bullard is a leading manufacturer of thermal imagers with a complete line of advanced imagers for the fire service. Recently, the company introduced the latest in thermal imaging technology – the Eclipse personnel-issue thermal imager. The Eclipse, with a budget-friendly price tag, provides firefighters with a tool to help them safely navigate a fire. Its small and lightweight frame can be clipped to firefighters' gear, instantly providing them with a critical, life-saving device at their fingertips.

The Eclipse comes as standard with an 80 by 60 engine, but is also available in a higher resolution 160 by 120 engine for clearer, crisper and more detailed images. This optional feature makes the Eclipse perfectly-suited as a search and rescue tool. In addition to the higher resolution engine, the Eclipse is available with Bullard's exclusive Electronic Thermal Throttle (ETT) that aids firefighters in revealing hidden fire and distinguishing hotter objects. ETT saves critical time and prevents costly mistakes. Other optional features include high-heat colourisation, temperature measurement and customised start-up graphics.

Equipping firefighters with thermal imagers, such as the Eclipse, lessens the likelihood that a firefighter will become disoriented, trapped or lost. Disorientation is one of the leading causes of firefighter deaths during structural firefighting, and occurs when firefighters lose their sense of direction when visibility inside a structure is close to zero. Once disoriented, the firefighter has only a limited amount of time to find his or her way out of the structure or otherwise call for assistance.

Using thermal imagers provides firefighters with a greater opportunity to spot various hazards and dangers, such as increasing heat levels, structural weaknesses in the floor or ceiling, hanging electrical lines, stairs or skylights, fallen furniture and other obstacles. Putting thermal imagers into the hands of trained and capable firefighters can dramatically improve the efficiency of fighting fires.

Search and rescue

A time study was conducted in 2001 that compared search times without a thermal imager and search times with a thermal imager. The study revealed a staggering 75 percent decrease in search times when a thermal imager was used versus traditional crawl-and-grope. In the crawl-and-grope method, 30 percent of the victims were never located. When a thermal imager was utilised, the percentage of located victims climbed to 99 percent. So search time was reduced by 75 percent, and lives saved was increased by 39 percent.

Increased firefighter safety, increased operational efficiency, and most importantly, decreased search times all reinforce the value of thermal imaging. The Bullard Eclipse Thermal Imager offers fire departments the opportunity to equip firefighters with a search and rescue tool that aids in firefighter safety and is affordably priced. APF

For more information go to www. bullard.com

Hero Pipe Rises to the Challenge

Elkhart Brass introduce Hero Pipe, the first viable solution for high-rise urban fires that are beyond the reach of an aerial platform.

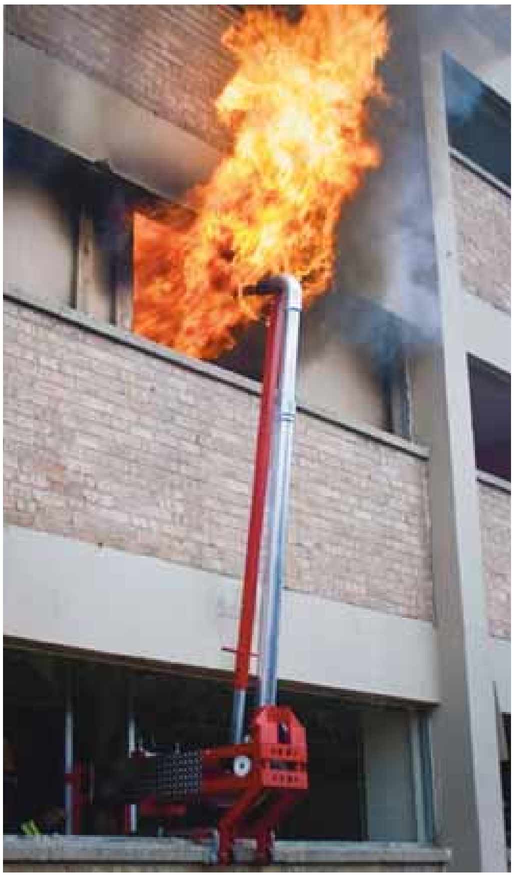
Fires in multi storey buildings above the reach of a ladder truck or aerial platform pose unique and potentially highly dangerous challenges for urbane firefighters attempting to fight the blaze directly. Now, for the first time, there is a truly viable and effective solution; one that delivers a high volume of water at the point of the attack from the floor below.

Hero Pipe from Elkhart Brass delivers the fire-fighting attack water from the exterior on virtually any building, targeting large volumes of water from an unmanned telescopic waterway. When combined with Elkhart Brass' Sidewinder EXM, this targeted stream can be directed by remote control. The floor-below design provides a significantly safer option for the neutralisation of hazardous material fires and, once the proper attack point has been established, Hero Pipe can be set up by a two-man team, and be in operation in as little as two or three minutes. Safety features include a control valve and pressure gauge that are utilised to eliminate the need for standpipe operator communication.

For the first time, there is a truly viable, safe and effective solution for fires in multi storey buildings above the reach of a ladder truck or aerial platform.

Hero pipe can be used on conventional load bearing walled buildings and those incorporating curtain walling hung off the building's structural framework. The assembly's base unit is clamped securely to the window sill of the floor below the fire or, in the case of curtain walled structures, it fits directly on the floor slab and incorporates a non-slip base footing. In either case, the Hero Pipe assembly is additionally restrained by the use of adjustable hydraulic stabilisers that are fitted between the structural floor and the structural ceiling of the storey below the fire. The pipe extends upwards out of the window to any height between 2.29 metres and 4.57 metres to the incident floor above. Hero Pipe incorporates a quick-connect coupler that ensures fast and easy adaptability, while a remote controlled articulated Elkhart Brass nozzle provides 40 degree horizontal movement and 80 degree vertical movement.

The Hero Pipe system is transported in four parts comprising: the base unit; the waterway; and the hydraulic stabilisers. The assembly's base unit is a one-piece assembly and is unloaded from the fire truck and rolled into position like a wheel-barrow. The assembly's sill clamps incorporate a ratchet locking mechanism that provides vibration-proof clamping and 635.6 kg of nominal pressure. The lightweight pipe rolls on tracked wheels and contracts to just 2.29 metres for ease of storage, transportation and handling. Each of the hydraulic stabilisers produces up to 158.9 kg of self-circulating end pressure.



By utilising Elkhart Brass' Sidwinder EXM the Hero Pipe is given the unique ability to deliver a targeted stream via remote control. This allows the operator to use horizontal or vertical movement to reposition the water stream without exposing himself to any unnecessary danger. A further enhancement is to combine the Hero Pipe assembly and this compact, high-flow electric monitor with a high resolution thermal imaging camera. This enables the hottest areas of the fire to be ascertained, and the nozzle to be targeted accurately for the greatest and swiftest effect. The recommended camera for this application is Bullard's T4 Max and digital command centre. APF

For more information go to www. elkhartbrass.com

Fires in high-rise buildings beyond the reach of ladder trucks pose unique and potentially dangerous challenges to firefighters attempting to battle the blaze directly. Elkhart’s HERO Pipe system is a true game-changer. Because the HERO Pipe can deliver a high volume of water at the point of attack from the floor below, it is the first viable solution for high-rise fires.

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Ready for Take-off

We seem to depend on airports more than ever with passenger numbers rising through most major hubs, but what types of systems are used to protect the aircraft we rely on, to get us safely to our destinations?

Mike Willson

Kidde Australia

Singapore has seen passenger numbers up 7.5% over 2009, Melbourne passengers rising 10% in 2010, Dubai an impressive 13.6% increase over the previous year and even Heathrow up 3.4% after a difficult year with volcanic ash shutting down the airport during spring 2010. Combined, these four airports alone carried 180 million passengers in 2010. Consider how many passengers there may be globally!

These scarily large figures highlight the number of aircraft and maintenance checks that are required to keep us flying safely, and new larger aircraft like the A380 Airbus are likely to see numbers continue increasing.

Few of us consider the important role aircraft hangar fire protection systems play in achieving such high levels of safety. Any servicing delay or fire incident here cannot only damage aircraft, they can upset take-off and landing slots, delay schedules and deliver severe cost penalties to operators with the potential loss or serious damage to complex and very expensive aircraft, critical component stocks and specialised maintenance equipment.

As planes get larger, so do the storage and maintenance hangars required to overhaul, paint, upgrade and maintain them, with inherent increasing risks. In response, the approaches being used to protect them are beginning to change.

Standard flexibility is the key

The latest 2011 update of the USA's National Fire Protection Association's NFPA 409 Standard on Aircraft Hangars provides the most detailed set of recommendations available; but are they the most practical and effective?

Having been in place for many years, to some the regular updates to this Standard may seem like minor tinkering at the edges, without any major overhaul to re-assess the hazards and modern

technological advances that may be better suited to dealing with them. Yet there is also a view that the tried and tested systems work, so why change them? Minimising the use of water, foam and alternative media resources is one motivator for change, along with the constant drive to reduce construction and operating costs to remain competitive in the global marketplace.

For the largest Group 1 hangars this Standard is rightly emphatic that speed is of the essence – fire control within 30 seconds and extinction within 60 seconds are primary system requirements.

But there are a confusing number of options available to choose from on how best to achieve this. These are based on either a foam/water deluge system and supplementary under-wing protection, or a water sprinkler system with either a low expansion (LEX) or high expansion (HEX) foam system at low level to cover any flammable liquid spillages across the floor. There is no guidance on which may be best for specific applications. Further options are also permitted for Group 2 and Group 3 hangars.

This standard is also remarkably reticent in defining the type of detection systems needed, which is surely key to success in achieving that swift 30 seconds to control any fire across the floor area. Surprisingly it only requires a combination of rate-of-rise, fixed-temperature or rate-compensation type heat sensing detection systems, lacking any detail, and more widely used in the terminal buildings. It prefers to refer fire safety managers to NFPA 72 National Fire Alarm Signalling Code, where its best answer is: "…for the performance objectives and application scenarios, supported by data, modelling and calculations should be submitted to the Authority having jurisdiction, for their approval." The good news is that this still permits any proven new technologies to be justified and where appropriate, potentially used.

Modern detection advances

The more recently written European EN13565-2:2009 standard (Fixed Firefighting Systems – Foam Systems Part 2: Design, construction and maintenance) goes further. It recommends two different flame detection methods for Type 1 hangars and for smaller Type 2 and Type 3 hangars; a single flame detection plus secondary heat sensing detection to trigger fire protection system activation and minimise the occurrence of false alarms, which can be massively disruptive in an aircraft hangar environment.

This enables the modern challenges of larger distances across wider span hangars to be controlled, vapour build up from fuel, cleaning solvents and corrosion control (painting), radar and electrical interference, all to be addressed by permitting the latest advances in infra-red flame detection to be employed.

Some flame detectors can be triggered by aircraft or airport radar, electrical signals from communication devices, and X-ray machines. The programmability, quick response and field of view adjustments available in the latest multi-spectrum infra-red (IR) flame detectors avoid unwanted false alarms from nuisance signals like welding, x-ray inspections and radar signals. It achieves this by measuring radiant energy in three separate bandwidths at the same time, and will detect the presence of flames among this normal radiative energy working environment.

Detronics X3301 MultispectrumIR unit in

Advanced X3301 multispectrum IR detector

particular has a long detection range enabling detection of a 0.2 square metre fuel fire from 60 metres away on the detector's axis yet still picks it up 47 metres away off-axis. This requires fewer units to cover large areas because of increased overlap of this detector's cone of vision. When located on hangar walls approximately at wing tip level, they are better able to monitor the area beneath the wings, where fires are most likely to start and fuel leaks can quickly lead to developing pool fires. They also have a program delay to avoid them picking up the instantaneous flame sometimes occurring with widely used gas heaters in colder climate hangars, to avoid false fire protection system operation. These are also ideal for detecting problems on the apron area where planes arrive at the airbridge for disembarking.

UV/IR detectors require both sensors to indicate a fire before triggering an alarm, which also makes them robust against spurious activation, while other Dual IR detectors and CCTV video smoke detection systems are becoming accepted as alternative options.

Early fuel leak warnings can also be effective drivers for fast response detection in these hangar environments. IR combustible gas detectors like the Pointwatch Eclipse have developed a well known reliability and long service life in hangar environments, remaining unaffected by agents that can poison catalytic bead sensor type devices. This can be incorporated into an integrated fire and gas detection system that can be customised to meet specific hangar or operator requirements.

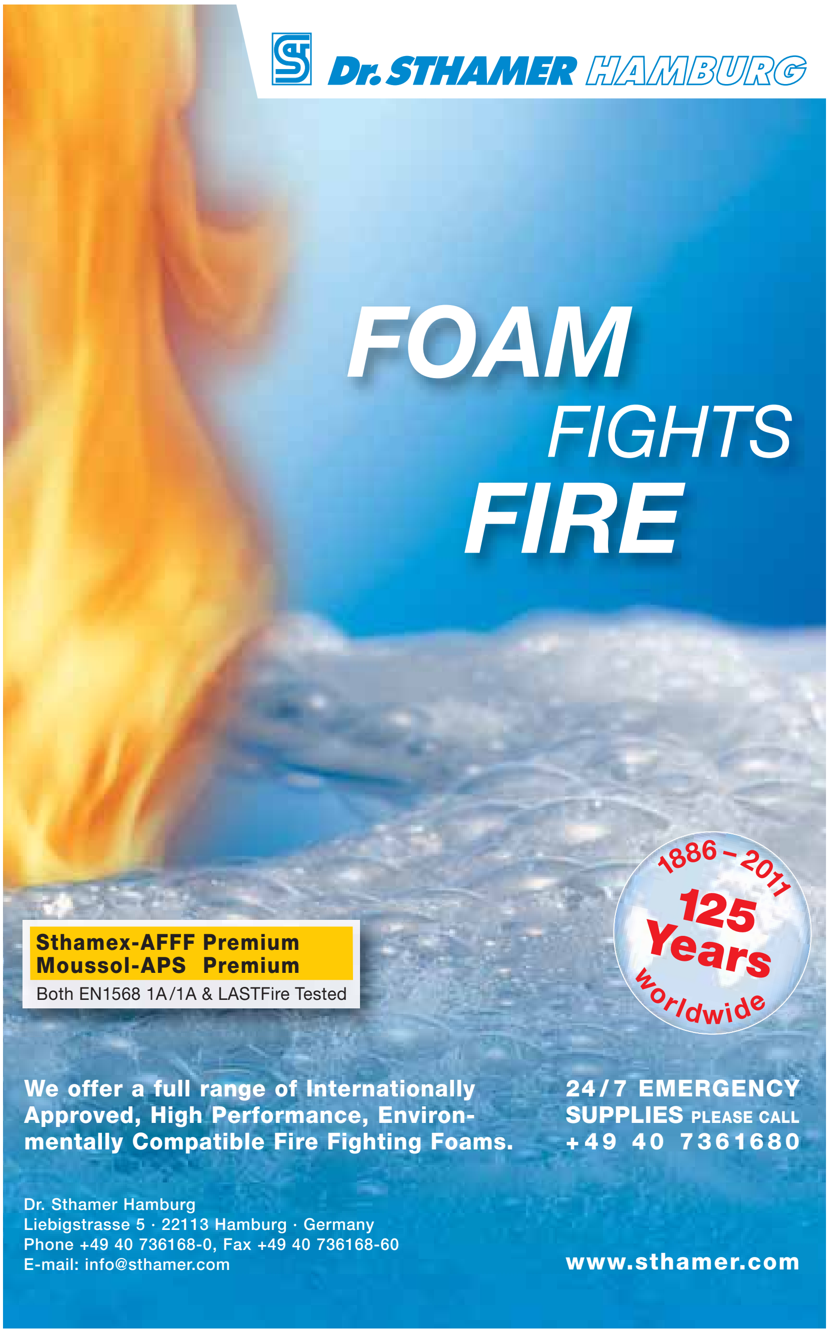
The relatively high vapour pressure of aviation gasoline enables quick detection by these combined IR combustible gas detectors, yet aviation jet fuels like Avtur, although with relatively lower vapour pressures, can easily enter the combustible range as the ambient temperature rises.

Efficient fire protection focus

EN 13565-2 also offers more flexibility by opening up the fire protection system options for all types of hangar, moving away from insistence that high water demand deluge or sprinkler systems must be used.

We are seeing a growing number of interesting combinations now being used for hangar protection. High and low level aspirated or non-aspirated foam oscillating monitor systems like the OM80 provide a fast response when delivering a reliable and uniform foam blanket across fuselage, wings and hangar floor area in the first sweep, to quickly control and extinguish any fire condition. These low profile, reliable automatic oscillating monitors can be easily interrupted into full manual control to target any hot spots and then returned to automatic oscillation, as required. They are entirely water powered, avoiding specific back-up power supplies, and will operate at water inlet pressures down to 5 bar. Many have now been successfully installed in both civil and military aircraft hangars. Tridol S 1% and 3% AFFFs has been shown to be particularly effective in this combination in hangars and for offshore helideck protection, where Petroseal 3% FFFP (Film Forming Fluoro Protein) foam is also popular.

High expansion foam systems are attractive as they use very little water and reduce weight loadings where foam generators are located in the roof, but they should use water-powered forced air technology ensuring that a reliable and uniform bubble size is maintained. Systems have been installed to deliver expansion ratios of 1,000:1 but this is generally only considered appropriate for unfuelled aircraft hangars.



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High pressure Hi Fog water mist nozzle operating

Where fuel hazards could produce a pool fire, this expansion ratio is too dry to efficiently control and extinguish hydrocarbon fires. Experience has shown that 500:1 at least for under-wing protection is more effective, and capable of controlling a fire from fuelled aircraft within the 30 second time frame, with full extinguishment within 60 seconds.

This drive to reduce water demands, plus the consequent run-off and treatment issues is seeing an interesting development in the area of highly efficient watermist systems, which could be considered in future for aircraft hangars up to about 15 metres high. There may be grounds for testing with low level foam systems to provide an effective combined system.

Using high pressure breaks up the droplets into a fine mist and drives it into the fire, maximising efficiency of the water by absorbing more heat. It works by this quenching effect, cooling the burning materials and other potential fuel sources nearby below their auto-ignition temperature, while also inerting the atmosphere with steam near the flame front and reducing oxygen availability to the fire. It also blocks radiative heat transfer to adjacent combustible materials, slowing the propagation of fire and reducing the risk of escalation. Smoke particles bind with the steam which helps to reduce travel into other areas where heat and embers can increase fire risk, while also reducing the resultant smoke damage.

Whereas conventional sprinkler or deluge systems typically produce droplets of between 1mm and 5mm diameter, which may deliver up to 2 million droplets from a litre of water with a droplet surface area of around 1.6 square metres, low pressure mist systems reduce the droplet diameter further towards 0.2mm, increasing droplet density per litre to around 200 million, and droplet surface area to around 25 square metres; at best about a 15 fold increase in efficiency.

The high operating pressures of Hi-Fog watermist break up the droplets to an even smaller size typically between 0.025mm and 0.2mm diameter, dramatically increasing the droplet volume in a litre of water up to potentially 150 billion! This significantly increases the droplet surface area for quick heat absorption, ten times up to 250 square metres – potentially 150 times more effective than a conventional sprinkler system. It therefore provides far superior radiant heat blocking and vapour inerting, as it readily turns to steam and delivers a rapid cooling capability. All this can be achieved by using typically 90% less water than a conventional sprinkler system, which tends to lift any burning flammable liquids and spread them on the water layer into other areas.

Such high pressure water mist systems could bring additional benefits for hangar applications, where reliability can be achieved using clean water filtered through 100 micron filters before entering the complex delivery nozzles. Not only is it a very efficient and clean medium without the risk of residues contaminating expensive engines and avionics, it is also completely harmless to people, most outdoor machinery, and does not require a sealed space, like the best of the inert gaseous agents it is sometimes compared against. From an aircraft perspective, it could be no different to flying through a dense cloud, which they do regularly most days of their life.

Compared with sprinkler or deluge systems, high pressure watermist could deliver better cooling effects from faster evaporation, better penetration into the seat of the fire, and better coverage of the protected area with far lower water consumption and a lower overall system weight. It could also lend itself to combining with low level High Expansion (HEX) foam systems that complements this low water demand philosophy; but further testing would be required. The fine droplets would be less damaging to the foam bubbles providing the nozzles were located a good distance from the foam surface, so that any breakdown factor being considered necessary, should be very low compared to conventional sprinkler or deluge systems.

All this makes for an interesting future, with new fire system possibilities to explore for more efficient aircraft hangar protection, to match the advances in aircraft technology that are maintaining growth trends in our travels around the globe. APF

Mike Willson is a consultant for Kidde Australia

For further information, go to www.kidde.com.au

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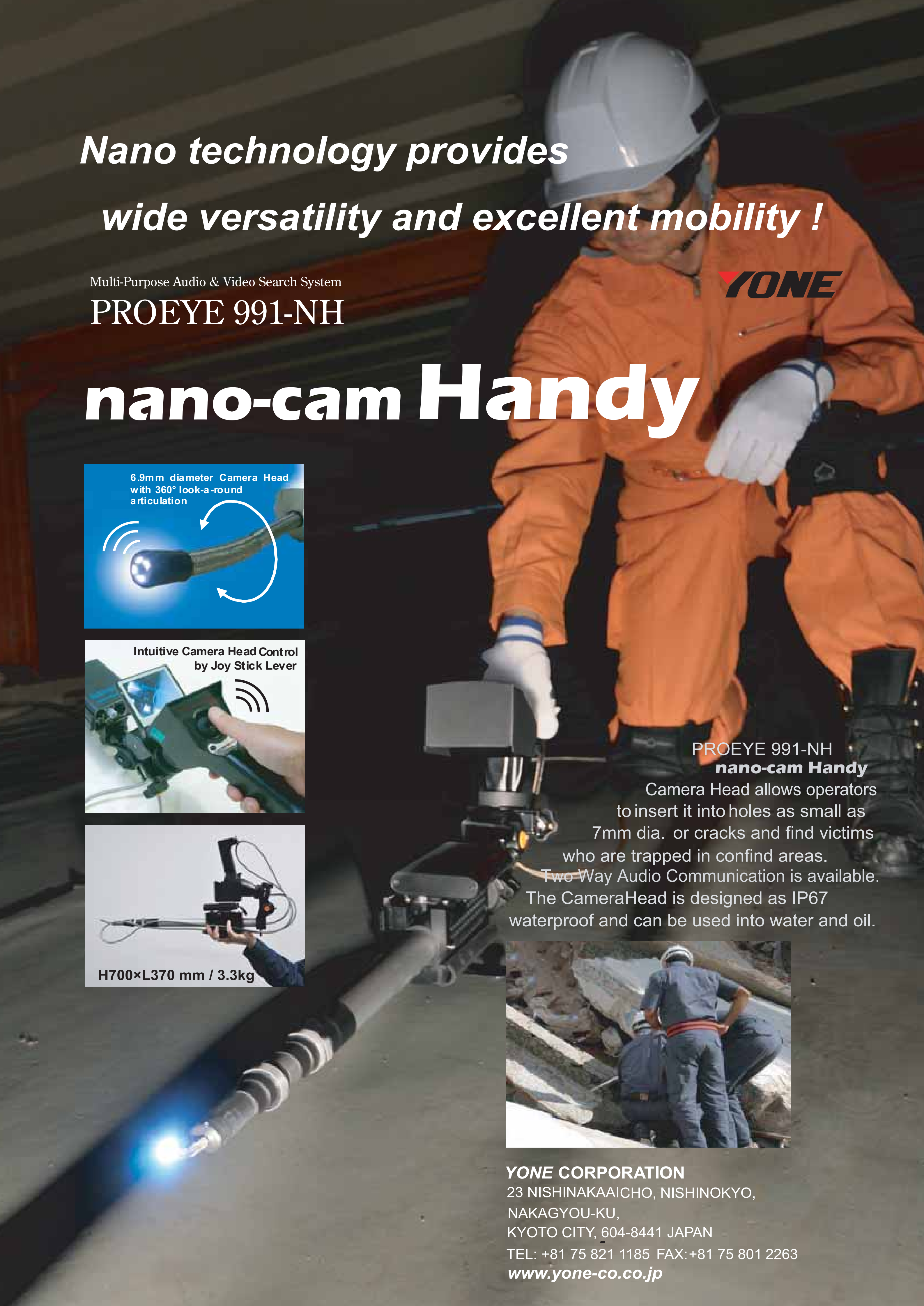

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Confined Space Rescue –

Are Your Firefighters Prepared?

Steven Gregory McLeod

Fire and Safety Australia

Combine toxic atmospheres with conditions of low visibility, entanglement hazards, moving parts, the risk of engulfment and restricted methods of entry and you are presented with the possible conditions within a confined space and one of the most challenging forms of technical rescue.

Confined space rescue involves completing the rescue of entrapped or injured personnel often within very small and narrow spaces that may expose crews to a variety of hazards. It is one of the most dangerous forms of technical rescue, as it combines a hazardous atmosphere with other less encountered hazards such as engulfment and entanglement. For fire crews to complete safe rescues of personnel within confined spaces they must understand the hazards that may be found within confined spaces, understand what skills and knowledge 'local workers' may provide, and complete specific confined space rescue training across a variety of typical scenarios that are common within their response area.

To reduce the likelihood of fatalities and injuries to firefighters, they must be equipped with an understanding of their local 'typical' confined spaces, have a thorough understanding of confined space hazards and understand the typical control measures that may be used to make the confined space rescue safer.

Confined space hazards

Hazard identification is part of daily emergency response activities by fire crews worldwide. Confined space hazards however present specific hazards and risks and can present real dangers to fire crews. Hazards often involve the design and operation of the confined space as well as the

atmosphere and the conditions found within.

Hazards in confined spaces include but are not limited to:

- Oxygen deficiency and excess.
- Hydrogen sulphide and carbon monoxide.
- Explosive atmospheres.
- Entanglement and injury from moving parts such as augers, agitators and belts.
- Engulfment by a solid, liquid or gas.

Confined space hazards differ greatly based on the type of industry and the confined spaces encountered. These hazards must be fully understood by fire crews as they may be encountered in any number of confined space incidents.

The cat down the drain scenario

At 1500 hours you responded to a cat trapped within a storm water drain on a quiet residential street. Once on scene you are told by the cat's owner that the cat has disappeared down into the storm water drain on the street corner. Two firefighters open the storm drain cover and look down to see an eight-metre deep storm water drain. You see a cat at the bottom of the drain lying very still. You call out to the cat but no answer. One of your firefighters grabs the ladder from the truck and gets ready to pitch the ladder into the drain.

What do you do and what hazards do you consider? What caused the cat to die? What hazards could be within the drain? What hazards may affect your crew? Should you get the cat out for the owner? Should you let your firefighter descend the ladder and rescue the cat? Is this a confined space?

The situation described above is not uncommon. Many fire crews would simply descend the ladder to rescue the cat, but what are the risks and what are the consequences?

This is an example of how confined spaces that are outside of a typical industrial confined space rescue scenario can be presented to fire crews. Obviously, all crew members start to consider the hazards of confined spaces while en-route to a rescue. However, in common emergency callouts such as this, if fire crews are not well educated in what a confined space is and the potential hazards within, they may be at risk of an injury or fatality.

Let us consider the above example. What hazards may be present and what control measures should be considered? Typical hazards for the scenario above include but are not limited to:

- **Oxygen deficiency.** Oxygen deficiency occurs below 19.5% oxygen concentration. As the level of oxygen drops within the storm water drain, it will affect the human body. While the initial effects include headache and a lack of coordination, as the level of oxygen decreases personnel will become unconscious and eventually die.
- **Hydrogen Sulphide (H_2S).** Hydrogen Sulphide is caused by the decomposition of organic waste. In this situation, the dead cat could actually be decomposing and giving off Hydrogen Sulphide. H_2S deadens the sense of smell and can cause severe illness. H_2S may displace oxygen and cause effects to the human body.
- **Engulfment.** Has there been rain or flooding in the last few days? Is there water flowing within the drain? Are there small or large outlets within the drain (considering that large outlets may cause engulfment or drowning to occur more quickly)?
- **Falls from height.** The fall risk in this scenario is eight metres, which is sufficient to cause multiple serious injury or death.

The example above should cause those of us that are well trained to size-up the situation and consider what appropriate control measures should be used. Realistically we should consider several active control measures for each of the hazards outlined above. Consider the following control measures to be the absolute minimum that should be implemented prior to recovering the cat:

- **Gas Test.** A gas test should be performed across all levels of the space but paying particular attention to the lowest area within the space. Hydrogen sulphide is heavier than air with an air density of 1.19. It will accumulate at the lowest point within the space. Perform a gas test to check for unsafe atmospheres. Pay particular attention to the Oxygen, H_2S and possibly methane levels.
- **Containment Area.** Currently you have an open manhole and a risk of a fall from height. Consider barrier taping the area and implement a control zone to reduce the likelihood of having a bystander or a firefighter fall into the drain.
- **Fall Protection.** If you consider recovering the body of the cat, you really should consider using a tripod and winch or a davit and winch to provide active fall protection and emergency rescue. The method of fall protection should be based on the equipment that is available at the time and the familiarity of your crew with the equipment.

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THE ORIGINALS in Rescue Equipment

- **Personal Protective Equipment.** You should consider getting your personnel to wear rubber gloves to avoid bacterial infection when handling the cat.
- **Local Authorities.** You should consider contacting your local water board or water authority to obtain any flooding reports or reports based on water movement within the drainage system.

While many firefighters may consider the control measures above an unnecessary hindrance, the dangers posed by confined spaces are real and they must be considered and controlled. The safety of firefighters is our number one priority, so do not let a dead cat affect the safety of your personnel.

Local knowledge

Fire crews may receive an emergency call for a confined space rescue and find themselves at a site with a multitude of hazards to consider with no real technical knowledge of the confined space itself or the surroundings (after all we are firefighters not engineers). Wherever possible, seek out local knowledge and help as soon as practicable on arrival to assist in your size-up. Track down local workers who have knowledge about the confined space and ask them about the hazards and risks *before any rescue is considered.*

Question the local personnel about at least the following:

- What are the hazards within this confined space?
- How long has the person been in there for?
- Has a gas test been completed and what were the results?
- Is the confined space isolated?
- What do you think has caused this incident?
- Are there multiple entry points?
- What should we consider prior to entry?

The answers to these questions will often provide you with valuable information about the confined space and may cause you to either complete a rescue or wait until the conditions within the confined space have been made safer.

Industrial confined spaces can be very complex and I have encountered spaces that have in excess of 100 individual isolations. Consider the advice of local technical experts very carefully and always look at the worst case scenario before implementing a rescue. For fire crews to understand typical hazards from confined spaces within their response area, they should liaise with local workplaces and industry and complete regular 'walk-arounds'. These walk-arounds of local industry are useful to help fire crews understand the types of hazards that may be encountered.

Localised and specific confined space rescue training

Fire crews are experienced in utilising SCBA and atmospheric monitoring equipment at fires and HazMat incidents. However, fire crews will be less experienced in rescuing personnel from within industrial confined spaces such as boilers, pressure vessels and vats. Fire crews often practise confined space rescue in storm water and sewerage drain, which is very useful to build foundation skills. However, when was the last time that your personnel completed rescue drills within tanks, boilers, kilns, grinding mills or pressure vessels?

The reality is that many urban fire brigades do not complete such drills. They believe that it is 'too hard' and industry does not want them in their workplaces. My experience is that nothing could be farther from the truth. Often, personnel in industry feel 'lost' when it comes to confined space emergencies and most are only too happy to have their local fire brigade come and complete a rescue drill or scenario.

We need to train in environments that are as realistic as possible. Whenever possible involve your local industry and train your firefighters in the types of rescue that are most realistic within your response area.

After instructing in confined space entry and rescue for over five years, I often hear prospective clients who want advice and assistance from their local fire brigade and will only be too happy to include you in their drills and simulations. By involving your local industries in emergency preparation, you will feel more comfortable with this challenging and often dangerous type of technical rescue.

Summary

Confined space rescue is one of the most challenging forms of technical rescue as it combines the hazards of structural firefighting with the challenges and intracasies of vertical rescue within small and often hard to reach confined spaces.

For fire crews to attend confined space rescues and complete a rescue safety, they must be educated in the hazards of confined space rescue and they also must consider their local response area and the types of confined space incidents that may occur. **APF**

Steven Gregory McLeod is Managing Director of Fire and Safety Australia Pty Ltd

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Post-Halon Fire Suppression

Graham Collins

The 2010 report of The Halons Technical Options Committee (HTOC) has recently been published by the United Nations Environment Programme (UNEP). The 70,000-word document runs to something approaching 200 pages. While much of the space is devoted to the production, banking and consumption phase-out of halon, a considerable amount of space is taken up with looking at the current state of play of the fire protection alternatives.

The background to the halon phase-out is pretty well known. Although non-conductive, and highly effective, halons are very potent stratospheric ozone depleting chemicals when released to the atmosphere. Halon 1301, in particular, was safe for use in occupied spaces when used at concentrations typically employed for total flooding systems. It was also widely used in portable fire extinguishers.

Alternatives to halon, in the form of non-ozone depleting "in-kind" or alternative gaseous fire extinguishing agents, gas-powder blends, powders and other not-in-kind non-gaseous agent technologies are now available for virtually every fire protection application once served by halons.

The HTOC Report asserts that alternatives based on hydrofluorocarbons (HFCs) continue to dominate the "in-kind" market for flooding applications, whereas alternatives based on hydrochlorofluorocarbon (HCFC)-123 dominate the much smaller in-kind streaming market. It goes on to state that, as yet, an alternative to halon with all of its beneficial characteristics has not yet been developed. The Report singles out pyrotechnic products that generate nitrogen, or mixtures of nitrogen and water vapour, and unsaturated hydrobromofluorocarbons (HBFCs) as new agents and technologies that continue to appear on the market for specific applications.

Alternatives to halon, in the form of non-ozone depleting alternative gaseous fire extinguishing agents, gas-powder blends, powders and other non-gaseous agent technologies are now available for virtually every fire protection application once served by halons.

The selection of the best alternative to halon for fire protection is, the HTOC concedes "often a complex process", suggesting that either in-kind alternatives, or not-in-kind alternatives may replace halon but that the decision is driven by the details of the hazard being protected, the characteristics of the gaseous agent or alternative method, together with the risk management philosophy of the user.

Alternative gaseous agents

HFCs, HCFCs, and to a much lesser extent perfluorocarbons (PFCs) have been commercialised as replacements for halons, and the development of these for use in fire suppression was certainly instrumental in the halon production phase-out brought about by the Montreal Protocol. In some applications, HFC based agents are the only alternatives for halons.

The Technology and Economic Assessment Panel (TEAP) update of the Intergovernmental Panel on Climate Change (IPCC)/TEAP Special Report on Ozone and Climate concludes that the greenhouse gas reduction potential from fire protection is small. This, it says, is due in part to the relatively low emission level and the significant shift to not-in-kind alternatives. Nevertheless, in 2009 and again in 2010 amendments have been proposed that would add HFCs to the Montreal

Protocol and slowly phase down their production. The suggestion contained in the Report is that the Parties to the Protocol may wish to consider that any future HFC amendments or adjustments include provisions for certain fire protection uses.

Gaseous extinguishing agents that are electrically non-conductive and that leave no residue are referred to as "clean" agents, several of which, along with new "not-in-kind" alternative technologies have been introduced to the market. In addition to these, a number of other technologies have been evaluated for fire extinguishing applications where halon might formerly have been used. These include water-foam technologies and several types of watermist systems.

The Report points out that halocarbon agents share several common characteristics, with the details varying from product to product. The common characteristics cited include that all are electrically non-conductive; are clean agents, meaning that they vaporise readily and leave no residue; are stored as liquids or as liquefied compressed gases either as single component agents or as multi-component mixtures; and can be stored and discharged from fire protection system hardware that is similar to that used for halon 1301. They differ widely in toxicity, environmental impact, storage weight and volume requirements, cost, and availability of approved system hardware.

The primary environmental factors to be considered for halocarbon agents are ozone-depletion potential (ODP), global-warming potential (GWP), and atmospheric lifetime, and the Report stresses the importance of selecting the fire protection choice with the lowest environmental impact that will provide the necessary fire protection performance for the specific application. The use of any synthetic compound that accumulates in the atmosphere carries some potential risk with regard to atmospheric equilibrium changes. Perfluorocarbons (PFCs), in particular, represent an unusually severe potential environmental impact due to the combination of extremely long atmospheric lifetime and high GWP.

International agreements and individual actions by national governments may affect future availability of these compounds and subsequent support for installed fire protection systems that utilise them. HCFCs, for example, are scheduled for a production and consumption phase out for fire protection uses under the Montreal Protocol in 2020 in non-Article 5 Parties, and 2030 in Article 5 Parties. Also, The United Nations Framework Convention on Climate Change (UNFCCC) has identified carbon dioxide, methane, nitrous oxide and the fluorochemicals HFCs, PFCs and SF6 as the basket of long-lived (more than one year) gases primarily responsible for anthropogenic – human impact on the environment – changes to the greenhouse effect and potentially subject to emission controls. In the EU, the "F Gas" Regulation introduces requirements to reduce emissions of specific fluorinated greenhouse gases and stipulates that no new fire protection products using PFCs should be placed on the market.

Emissions of HFCs and PFCs currently represent approximately 1% of total greenhouse gas emissions, with those from fire protection estimated at less than 1% of total HFC and PFC emissions (or less than 0.01% of total greenhouse gas emissions) from all sources.

The Technology and Economic Assessment Panel (TEAP) update of the Intergovernmental Panel on Climate Change (IPCC)/TEAP Special Report on Ozone and Climate estimates that, as of 2009, about 20% of the former halon market for total flooding applications was replaced with HFCs, with about 50% of the market choosing not-in-kind alternatives and about 25% opting for zero/low GWP alternatives such as fluid-based fluoroketone, inert gases, and carbon dioxide. PFCs made up less than 1% of the former halon market and are no longer installed in new fire protection applications. Annual emission rates for HFCs are estimated to be 2% for total flooding systems and 4% for portable extinguishers.

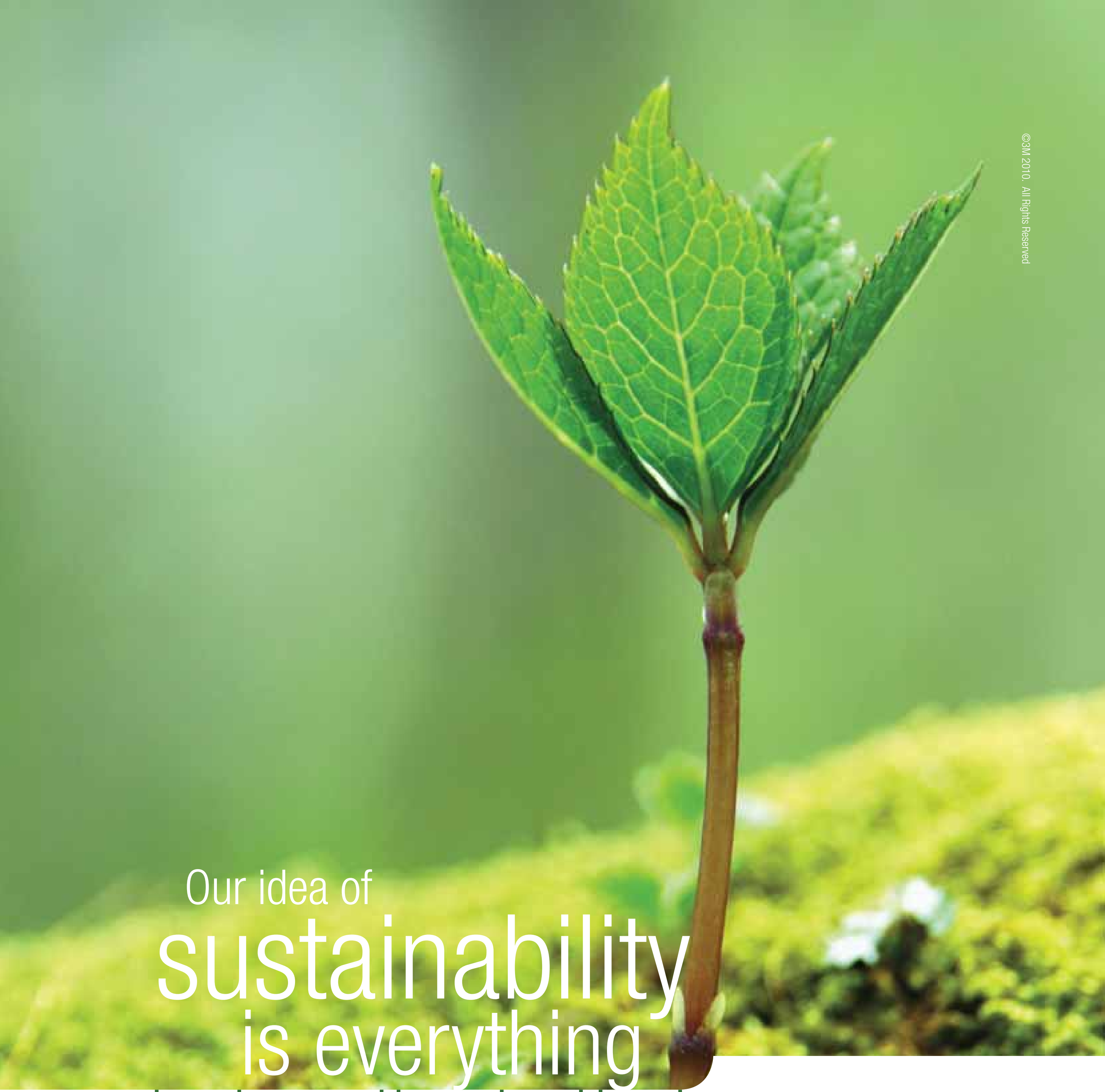
Carbon dioxide

Carbon dioxide has seen something of a resurgence in use following the halon production phase out, particularly in new commercial ship construction where halon once had a significant role. It is essentially chemically inert as a fire extinguishing gas, but does have significant adverse physiologically effects when inhaled at concentrations above 4% by volume. Exposure to carbon dioxide at concentrations exceeding 10% poses severe health threats including risk of death. As such, atmospheres containing carbon dioxide at fire extinguishing concentrations are always lethal to humans. The carbon dioxide used in fire protection applications is not produced for this use; it is captured from an otherwise emissive use temporarily sequestering it until it is released, so carbon dioxide from fire protection applications has no net effect on the climate.

Inert gas agents

The inert gas agents commercialised since 1990 are nitrogen, argon, or blends of nitrogen and argon; they have neither ozone-depletion potential nor global-warming potential and so pose no risk to the environment. They are electrically non-conductive, clean fire suppressants. However, the use of inert gases or gas mixtures reduces the ambient oxygen concentration and this is their principal potential human safety risk. That being said, the use of reduced oxygen environments has been extensively researched and studied and many countries have granted health and safety approval for use of inert gases in occupied areas in the workplace.

Gaseous extinguishing agents that are electrically non-conductive and leave no residue are referred to as "clean" agents, several of which, along with new "not-in-kind" alternative technologies have been introduced to the market.



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Watermist

The Report highlights fine watermist technology as one of the non-traditional halon replacements that has been developed and commercialised, due primarily to its low environmental impact, ability to suppress three-dimensional flammable liquid fires, and reduced water application rates relative to automatic sprinklers.

Watermist systems generate and distribute very small mist droplets within a protected space that extinguish flames by the combined effects of cooling and oxygen dilution by steam generated upon water evaporation. Technologies used to generate fine watermist include: low-pressure single-fluid atomisation: high-pressure single-fluid atomisation: dual-fluid atomisation; and hot water steam generation.

Recent innovations have included the use of nitrogen with watermist to achieve inert gas extinguishing effects, and use of bi-fluid, air and water nozzles to achieve ultrafine droplets and adjustable spray patterns that are achieved by varying the air-to-water ratio. To date, these applications have, according to the HTOC Report included shipboard machinery spaces, combustion turbine enclosures, flammable and combustible liquid storage spaces, as well as light and ordinary hazard sprinkler application areas.

The performance of a particular watermist system is strongly dependent on its ability to generate sufficiently small droplet sizes and distribute adequate quantities of water throughout the compartment. The major difficulties with watermist systems are those associated with design and engineering, arising from the need to distribute the mist throughout the space while gravity and agent deposition loss on surfaces deplete the concentration and the need to generate, distribute, and maintain an adequate concentration of the proper size droplets.

In terms of the physiological effects of watermist, the executive summary of a medical panel set up to address questions concerning the potential physiological effects of inhaling very small water droplets in fire and non-fire scenarios stated: "The overall conclusion of the Health Panel's review is that . . . watermist systems using pure water do not present a toxicological or physiological hazard and are safe for use in occupied areas. Thus, the EPA (Environmental Protection Agency) is listing watermist systems composed of potable water and natural sea water as acceptable without restriction. However, watermist systems comprising mixtures in solution must be submitted to the EPA for review on a case-by-case basis".

From an environmental standpoint, watermist does not contribute to stratospheric ozone depletion or to greenhouse warming of the atmosphere. Water containing additives may, however, contain other environmental contamination risks, for example antifreeze and other additives.

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New or emerging technologies

The Report details several new and emerging technologies. These include the development of HFCs with low global worming potential, and fluid-based Fluoroketone. FK-5-1-12 – used in total flooding applications – is being further evaluated as a local application or streaming agent.

Other new or emerging technologies include inert gas generators; pyrotechnic devices that utilise a solid material that oxidises rapidly, producing large quantities of carbon dioxide and/or nitrogen. Recent innovations include generators that produce high-purity nitrogen or nitrogen and water vapour with little particulate content. The use of this technology to date has been limited to specialised applications, such as dry bays on military aircraft, and has demonstrated excellent performance in these applications with space and weight requirements equivalent to those of halon 1301. Gases emitted by these products do not contribute to stratospheric ozone depletion or to greenhouse warming of the atmosphere except to the extent that they emit carbon dioxide, if any.

Another category of technology being developed and introduced relates to fine solid particulates and aerosols. These take advantage of the well-established fire suppression capability of solid particulates, with potentially reduced collateral damage associated with traditional dry chemicals. To date, a number of aerosol-generating extinguishing compositions and aerosol extinguishing methods have been developed and are in use protecting a range of hazards, including nuclear power station control rooms, automotive engine compartments, defence premises, engine compartments of ships, telecommunications/electronics cabinets, and aircraft nacelles.

However, the Report states that there are several potential problems associated with the use of these agents. These effects include inhalation of particulate, blockage of airways, elevated pH, reduced visibility, and the products of combustion from combustion-generated aerosols, such as HCl, CO, and NOx. For these reasons, the majority of these technologies are limited to use in only unoccupied spaces. Fine particulate aerosols themselves and associated inert gases from generators do not contribute to stratospheric ozone depletion or to greenhouse warming of the atmosphere. There may be ozone depletion or greenhouse gas effects, however, where aerosols are delivered with halocarbon carrier gases. APF

This article is based on United Nations Environment Programme (UNEP) 2010 Assessment Report of the Halons Technical Options Committee. A full copy of the Report can be found at http://ozone.unep.org/teap/Reports/HTOC/HTOC-Assessment-Report-2010.pdf

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Image courtesy Sundström Safety AB, Sweden

Beyond the Minimum Standards

Torbjörn Lundmark

Smartworx Studios Pty Ltd

Manufacturers and users of breathing protection equipment face a dilemma when it comes to standards approvals. Should the standards mark convince you that the respirator is good enough for you and for your work?

Ask yourself these questions: Is a standards approval important when selecting respiratory protection? What do you think when you see that a product carries a standards logo? Do you let the standards mark convince you that the respirator is good enough for you and for your work? Or do you go further, finding out more, checking that the respirator is suitable for *your* particular work, and that it is capable of giving you the performance, protection level, comfort, practical use and efficiency you really need?

It is easy to take the standards approval for what it is not. It is *not* a guarantee that the equipment will function properly in all situations and environments. That is neither the intention of the standard, nor its purpose.

Some jobs – including many aspects of firefighting, rescue, investigation, clean-up and so on – place much higher demands on the equipment than a standards laboratory test. That the breathing gear carries the standards logo means little if you have to climb the fire stairs ten floors up a burning building. No standards test would ever reflect such conditions – nor does any current standard claim to do so.

What does the standards logo tell you?

There are many different standards around the world, but they all have one thing in common. Ostensibly, any standards approval means that the user of the breathing protection can rest assured that a good, solid product of a particular protection level has been selected. Or has it?

It is important to understand that major standards around the world today are *minimum* standards. What does this mean? Essentially it

Image courtesy Sundström Safety AB, Sweden

means only one thing: that the product passes minimum requirements set for its category, class or type. It does *not* mean that the respirator will give you the protection you need, for instance, to let you climb those ten storeys of fire stairs.

In short, a standards approval says very little about the performance, wearability, comfort and efficiency of breathing protection equipment. In effect, the standards approval is more about quality control and manufacturing consistency than it is about how the respirator will function in real life. Essentially, the standards logo tells you that the respirator passes minimum requirements in laboratory tests, and that the manufacturer has enough quality control in place to ensure that the respirators of the same model are in fact identical, or that the mask you buy today will be of similar quality as the one you bought last month.

Of course, a standards approval does give you an idea of performance and reliability as well. But do you know what the standards testing involves? Is it set at sufficiently high levels? Do the test procedures reflect the use of the product in actual work situations? Knowing the answers to these questions also means understanding that a standards approval is not the only factor to consider when selecting a respirator.

The manufacturer's and user's dilemma

Minimum standards create a dilemma for any maker of respiratory protection.

Of course, it is very desirable to sell a product that carries a standards approval. The approval is a strong selling point; without it, the producer of the equipment cannot claim that it is of reliable quality. But should the manufacturer take the easiest path, and simply produce respirators that pass the minimum standards – but only just? Or design breathing protection devices that offer many times better performance and protection levels than the minimum standard? If so, what is the incentive for the manufacturer to go to those lengths?

The trouble with minimum standards is that there is no difference between only just making the grade, or passing the test by a wide margin. In other words, when comparing respirators of the same type, there is no distinction in the standard between *adequate* equipment and *greatly superior* models. The user, too, faces this dilemma: the standards approval does not tell enough about the product's actual performance in real life. Nor does it let you compare products.

The World Trade Centre Experience

It is a mistake to assume that the standards approval alone means that the respirator is suitable for a particular job.

Many professionals in the fire services are well aware of what happened in the New York World Centre disaster in 2001. Fire fighters could not use self-contained breathing apparatus (SCBA) due to time constraints; the distances and times to reach critical zones were so great that they would run out of bottled air long before getting there. So the rescuers tried negative-pressure filter respirators, only to find that the breathing gear would not allow them to breathe freely during the ascent. They simply could not get enough air through the respirator.

Yet, most if not all of the masks were standards approved. The problem? They were simply not suitable for the task. But that is not the *standard's* fault.

The result was that the rescuers had to remove their masks, simply because the breathing resistance of the respirator was too great; the mask became an obstruction to breathing properly. It was a case of either removing the hindrance or quitting the rescue altogether.

Breathing resistance and minimum standards

Breathing resistance is one particular facet of respiratory protection where standards testing cannot be expected to reflect real life.

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DRY WEIGHT: 119 Kg / 262 lbs

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POWER: 6,6 Kw
DIMENSIONS: HEIGHT 69 cm / 27"
WIDTH 56 cm / 22", LENGTH 113 CM / 44.5"
DRY WEIGHT: 125 Kg / 275 lbs

MCH-6/SH
DRIVEN BY: HONDA PETROL ENGINE
CHARGING RATE:
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POWER: 3,5 Kw / 5.5 Hp
DIMENSIONS:
HEIGHT 35 cm / 13.7",
DEPTH 32 cm / 12.5",
LENGTH 78 cm / 30.7"
DRY WEIGHT: 38.5 Kg / 85 lbs

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Both inhalation and exhalation resistance are important: it was precisely these factors that forced the New York fire fighters (and many others) to remove their masks and expose themselves to serious breathing hazards. Think of a filter respirator as an air filter in a car. If the filter is clogged (that is, makes it hard for air to get through), the car's performance will suffer. The engine runs hot; the vehicle loses speed; it burns more fuel for less energy output; and it will not run well. In the end it might break down.

It has been shown that a respirator can impose such a great breathing resistance on your lungs that your maximum breathing rate is cut by almost 30%. On the other hand, a good respirator with much lower breathing resistance will impose perhaps only a 6% reduction during the same work. Yet *both* masks may very well carry the standards logo.

How is a respirator tested for breathing resistance? Most standards tests of negative-pressure filter respirators are done by blowing (or sucking) air through the mask, and then measuring to what extent the respirator obstructs the airflow. This makes sense, but there are two problems with most standards test methods: firstly, the continuous airflow and, secondly, the speed of it. Most standards tests are done with a continuous airflow. The air just blows and blows in a steady flow without interruption.

The trouble is, humans do not breathe like that. We breathe in, stop, breathe out, stop, then take another breath, and so on. In fact, usually we spend only about 20 seconds of every minute breathing in. The rest of the time is spent either resting at the 'top' or 'bottom' of each breath, or exhaling. In short, we spend only one-third of the time actually breathing in. That means that to inhale 100 litres of air during the span of one minute, a human must breathe in those 100 litres in 20 seconds. Do the maths: that means that the air must move into the lungs at a speed of 300 litres-a-minute at every breath you take. Standards testing's constant airflow translates to a flow *three times the speed* in actual human breathing.

There is no need to remember technicalities – just keep the 'three times' rule in mind when looking at standards testing: most standards authorities test the breathing resistance of respirators and filter in a continuous airflow of about 85 to 95 litres-a-minute (for instance, NIOSH (USA) tests at 85 l/min; European and Australia/New Zealand standards authorities test at 95 l/min).

Is this a realistic airflow? Not when you look at some examples from life. Measured in real people, the airflow into the lungs (and thus through the respirator and filters) often reaches much higher speeds:

- Body at complete rest: 30 l/min.
- Walking at 5 km/h: 90 l/min.
- Shovelling: 150–210 l/min.
- Smelter worker replacing anodes with sledge hammer: 300 l/min.
- Fire fighter during rescue: 450 l/min.

Why minimum standards are not enough

If your respirator is tested at less than 100 litres-a-minute, and your work involves breathing at speeds of 400 litres-a-minute, the test tells you practically nothing about the respirator's actual performance in your workplace. Will it still give you the protection you need? Will the filter withstand the airflow? What is the breathing resistance of the respirator at such a work rate? All these are unknowns as far as the standard goes, and the standard was never meant to serve as confirmation that the respirator will function properly in such conditions.

The bottom line

Standards testing and standards approvals have their place, of this there is no doubt. But they *do not* set out to indicate whether a respirator is 'fit for purpose'. The long-awaited new ISO standard might focus more on respiratory equipment being up to the task, but is still some way off. In the meantime, it is a mistake to view a standards approval as proof that the equipment will perform well in the real workplace.

Therefore, it is essential to dig deeper, to ask questions and get answers. Approach the manufacturer of the respirators you are interested in. Insist on facts. Find out of what the protection equipment is capable of doing, and what its limitations are. It is vital that your queries firmly place the prospective product in *your* workplace, doing *your* kind of work, in *your* particular environment.

Performance: what are the actual performance data, not just at standards test 'pass' level?

Breathing resistance: how does the equipment perform at realistic airflow rates? Hard work means hard breathing – often many times higher than standards testing.

Protection levels: are high protection levels maintained even at heavy work? What about breakthrough? Inward leakage?

Filter performance: will the filters be used in wet and humid conditions, in water spray or in oil mist? Certain filter types degenerate rapidly in such environments.

Voice communication: does the respirator allow effective speech transmission? Can it be fitted with a communication device? How important are voice commands in your work? Do you give and take orders, shout warnings, work in teams?

Equipment compatibility: can the same filters be used across several mask types? Can the breathing device be used together with other safety equipment, such as ear muffs, helmets, goggles?

Whatever your criteria for selecting personal respiratory protection equipment, it is your own health, well-being and life you are protecting. Do not rely solely on the standards approval. **APF**

Standards are more about quality control and manufacturing consistency than they are about how a respirator will function in real life.

Torbjörn Lundmark is
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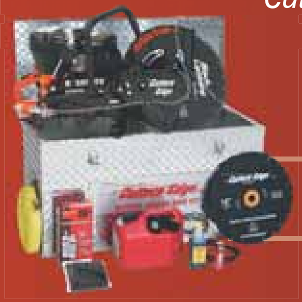

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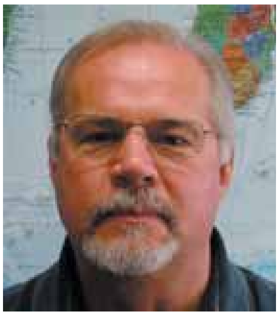


Thomas J. Ruzich

Cutters Edge

Will It Make The Cut?

The need to cut specific materials during rescue and firefighting is unlimited, but fast, safe and successful results depend on using the right saw.

Earthquakes, tsunamis, hurricanes, typhoons, tornadoes, floods, structural collapse, terrorist attacks, military actions, structural fires, vehicle accidents (buildings, trees, autos, trucks, buses, trains, aircraft, heavy equipment), the list is endless. But one thing they all have in common is the need to cut something in order to search for victims, make a rescue, force entry, ventilate, extinguish a fire, or clear an area. So, this article focuses on two types of saws: chain saws and rotary saws. Rotary saws are also commonly called disc saws, cut-off saws, chop saws or power cutters.

Safety, speed, ease of use and versatility are important factors not only to the saw operator, but to the trapped victim and nearby rescue personnel. The chain saw and the rotary saw both have exposed cutting implements – the cutting chain on the chain saw and the cutting blade on the rotary saw. The cutting implements on both saws are sharp and turn at a very high rate of speed, so caution is needed when operating these saws. A few manufacturers offer saws with guards covering the chain or blade and these can be very useful for both protecting the operator, allowing the depth of cut to be set to a predetermined depth – to protect against cutting through structural components that could weaken the object being cut, and to protect the trapped victim from accidental contact with the chain or blade.

The rotary saw, when equipped with an all-purpose vacuum-braised diamond blade, will cut virtually any material encountered at a rescue or fire. But, because the cutting blade is a round disc, the depth of cut is limited. A 356mm diameter blade can cut only 127mm deep. A chain saw however, can cut the full length of its bar and chain, so a 510mm chain saw can cut the full 510mm deep. Chain saw chain made with carbide inserts – carbide-tipped chain – is capable of cutting most materials except ductile iron and concrete. Chain saw chain made with diamond

The chain saw is a hand-held engine or motor that drives a cutting chain around a guide bar

segments and run on a dedicated chain saw with special features, including water lubrication rather than oil, can cut reinforced concrete.

Yes . . . you read that correctly, a chain saw that cuts concrete! Even though the carbide-tipped equipped chain saw can cut light gauge sheet metal and the diamond-segment chain-equipped chain saw can cut the reinforcing metal within concrete, neither chain saw can routinely cut metal. Therefore, the need exists for a well equipped fire brigade or rescue team to carry multiple saws to insure that they are capable of cutting all the materials they may encounter at the fire or rescue scene.

Chain saws and rotary saws are not new to the fire service. Rotary saws have been in use for the last 40 years, and there are documented cases of the chain saw being used in the fire service as early as 1953. The rotary saws gained popularity in the fire service first using abrasive blades, and then with carbide-tipped blades and now diamond blades. The chain saw took much longer to become established as a viable fire rescue tool because the chain became dull very quickly when material other than clean wood was cut. It was not until 1966 when a Los Angles, California fire Captain, Martin Bullard, patented a method for attaching a piece of carbide to a chain saw cutter, that chain saws started to gain acceptance in the fire service

However, not until 1985 when another California firefighter, Tom Ruzich, developed a more secure method for attaching carbide to a chain saw chain cutter, patented a combination guard depth gauge, modified a chain saw engine to turn the chain faster and to operate in hot-smokey conditions, did the use of chain saws in the fire service finally became accepted. In 1993 Ruzich went on to develop and patent a unique carbide cutter design, the Bullet Chain, which still remains the state-of-the-art for fire rescue chain saw cutting.

The rotary saw is a hand held engine or motor that drives a circular blade

Both the chain saw and the rotary saw can be powered by gasoline-powered two-cycle engines, hydraulic motors, electric motors, or pneumatic motors. Over the past forty years, experience with chain saws and rotary saws has proven the gasoline-powered and the hydraulic-powered saws to be the best choice for fire rescue cutting. The gasoline-powered saws are the most popular and currently comprise up to 90% of chain saws and rotary saws in use. The hydraulic-powered saws make up the majority of the remaining 10% with a scattering of electric and pneumatics powered saws mixed in.

The gasoline-powered saws are most widely used because of their rapid deployment, ease of use, and unencumbered versatility. However, the gasoline-powered saws are loud, up to 104 decibels and produce harmful exhaust fumes, so use in a confined area, especially without ventilation, should be a consideration. Confined space is a good choice for the hydraulic-powered saws, and the amount of cutting and type of material also should be considered. Generally, hydraulic-powered saws are better suited to sustained cutting scenarios.

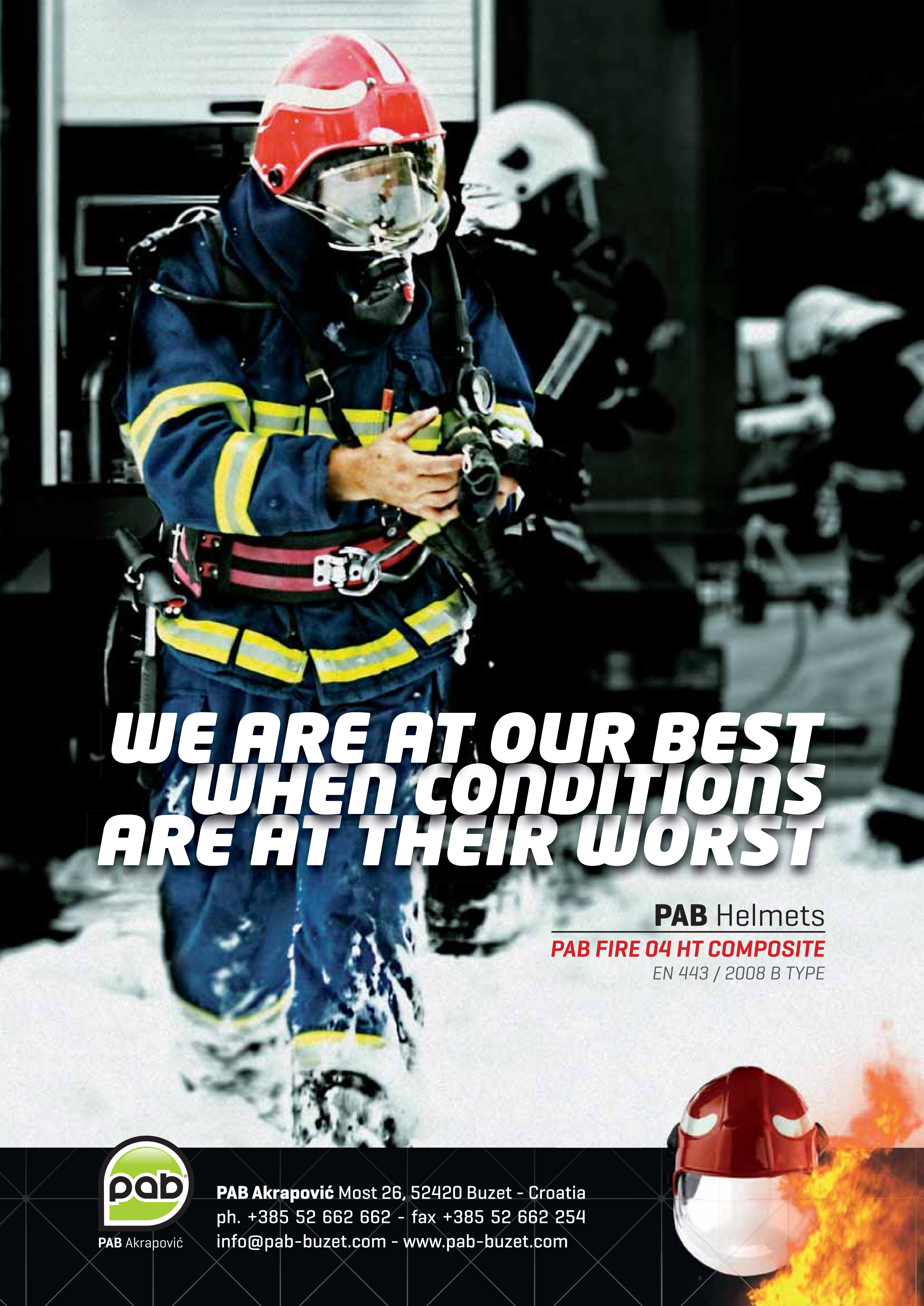
The Bullet Chain

So, what are the factors that go into the decision of what saw to use? Let's break this down into two basic categories; firefighting and rescue.

Firefighting operations

Wildland firefighting, forest fires, brush fire and other wildland/woodland fires, when taken together or separately, without question require the chain saw.

In fact the best suited saw is a standard gasoline-powered chain saw with standard (non-carbide) wood cutting chain. Cutting trees is what the chain saw was designed for and even though extreme heat and smoke may be encountered, the ambient atmosphere is generally sufficient to support the operation of a standard chain saw without



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any air intake modifications and running a standard wood cutting chain.

There are many manufacturers of standard chain saws and a good quality chain saw will get the job done. However, this is where size matters, or more aptly, power matters. Let us say that for the area of responsibility your geographic territory covers, a 510mm cutting length is the size you need. There are chain saws with a 510mm bar that are powered by a 45cc engine, and there are chain saws with a 510mm bar that are powered by a 70cc engine. Power, weight and cost become considerations, so be very specific in your specifications, so you are sure you are getting a chain saw with enough power to get the job done.

Structural firefighting presents a different set of circumstances. The purpose for the saw in structural firefighting is to cut ventilation openings, force entry into the structure, open up areas to check for fire extension, overhaul, and to provide speedy intervention if a rapid intervention team is deployed. The atmosphere the saw may operate in at a structure fire can be extremely hot and smoke laden, and smoke generated during a structure fire can include unburned gases. These gases can be lighter than air and will easily flow through a standard saw's air filter.

During structure fires (and cutting concrete at rescues) water and steam can also penetrate standard filter elements. Remember a standard chain saw or rotary saw is designed to run in fresh air atmospheres. The air filters on these standard saws generally do not fare well in hot smoke laden atmospheres, and chain saws require a stronger more versatile carbide-tipped chain to cut the many different building materials that will be encountered. Structural firefighting is where value added features like large multi-stage external air filters, guards/depth gauges and special carbide-tipped chain saw chains, carbide tipped and diamond rotary blades are required.

Rescue operations

Rescue cutting encompasses every other cutting requirement there is. From cutting through multiple types of materials in a building collapse, fallen trees, crumpled cars, trucks, busses, trains and, aircraft to metal-reinforced concrete. Think about all the different types of materials that can be encountered at a building collapse. The cause of the collapse also makes a difference in what needs to be cut. For example, a building collapse caused by an earthquake will include the building materials themselves that need to be cut, such as wood, metal, plastic, sheet metal, concrete, wires, pipe and so on. But, in an earthquake followed by a tsunami, there will be all of these materials, but now they are covered in a layer of mud, stone and other debris.

Here in the Pacific north-west area of the United States there are interstate highways that traverse mountain passes that frequently experience extreme winter storms. These roads are major transportation routes for trucks hauling virtually every commodity imaginable. The combination of these tractor trailer trucks, some three trailers long, weighing over 45,000 kilos and icy roads with almost inaccessible ravines below can create challenging rescues.

Imagine a tractor trailer hauling 32,000 kilos of frozen meat. The truck slides off the side of the road and over the edge of a rock precipice coming to rest in a canyon 50 meters below. The trailer loaded with the frozen meat crushes the passenger compartment of the truck, trapping its two occupants. There is no road for emergency vehicle access down to the crushed truck, the closest crane and tow truck is over three hours away because of the major blizzard that caused the crash, and the hydraulic cutters and spreaders that you lowered down to the wreck just cannot contend with the enormous volume of material.

Both a rescue chain saw with a carbide-tipped bullet chain and a rotary saw with a diamond blade can be used here. Materials needing to be cut include metal, aluminium, plastic, glass-fibre and frozen meat. The rotary saw will cut all the metal and some of the aluminium superstructure. The chain saw will cut the aluminium trailer siding, the plastic, the glass-fibre . . . and the frozen meat.

Fire rescue technology continues to innovate and grow, and we have a tendency to gravitate to new technology because we are always looking for a better way. Sometimes new technology and innovation is simply applying existing tools to new applications. APF

Thomas J. Ruzich is President of Cutters Edge/Edge Industries, Inc.

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Fire Glazing –

System Specification And Best Practice

Fire resistant glazing and its role in effective passive fire protection – Simon Ellison examines the importance of system specification and best practice techniques.

Fire glass is rated according to three main classifications: integrity only (E), integrity with radiation control (EW) and integrity with insulation (EI). As one of the earliest fire safety glazing products on the market, wired glass is still commonly used today for E rated applications. However, continued advances in fire glazing technology have led to the development of clear and thinner products that are able to provide the full range of protection – from integrity only, up to fully insulated, which restricts heat transfer through the glass to the unexposed face.

From a design perspective, the challenge is often to achieve vast glazed areas. However, fire glass is only certified for use up to the maximum sheet size at which it was tested. It is important therefore to realise that fire protection performance is not achieved exclusively by the glazing – it must be proven to perform as part of a system along with the frames and seals.

The Importance of system specification

While specific testing procedures must be conducted in accordance with country legislation, best practice remains that the evidence/certificate should detail the glazing in application. For example, a test certificate should not only cover the fire glass, it should also confirm that the surrounding frame, seal and associated installation materials can withstand the same levels of fire integrity.

The testing of fire glass is always to maximum glazed size. However, in the context of system specifications, the importance lies in the detail of the complete construction. Any deviation from the specified materials, no matter how small they are deemed to be, will render testing certification invalid.

As such, at every point in the construction programme – from specification to installation – a critical factor to protect the integrity of fire protection performance is to ensure the system is being installed exactly as it is detailed. For example, where timber frames are being used, it is important to verify whether the beading tested as part of a system was hardwood or softwood, and if pins or screws were used. Although these might appear minor details, the difference between the fire performance of hardwood and softwood is significant.

FIRE GLAZING – SYSTEM SPECIFICATION AND BEST PRACTICE

As modern aesthetics demand the frame profiles and bead sizes to be as small as possible, it is important to check the size of beading that has been tested. For example, a system may be approved with 25mm beading but the specifier may wish to detail 15mm. Under these circumstances the test evidence would not cover the system specification. This also relates to the frame orientation. If the system is tested with the bead to non-fire, then this is the only orientation that can be used under the test evidence.

Regarding fixing methods, pins are often preferred to screws as they offer a neater finish and are quicker to install. However, there is a danger that when exposed to fire, the pins could fall out more easily than screws and compromise the overall system integrity. It is therefore important to request full test evidence of pins performing in a fire rated glazing system. Where a fire rated system is being used with pins, it is recommended that they are pitched at 200mm centres.

Another particular detail of significance is the glazing media. Dependent on the application and performance requirements, sometimes inert media such as ceramic tape is specified and other times intumescent is required. While this might appear a small detail in the overall system construction, any change to the media could compromise integrity, which is why the fire glazing system must be designed and installed to the exact specification that was tested.

Understanding testing protocols

Globally, system specifications and the associated testing of these remain of utmost importance. However, the idiosyncrasies of testing protocols across countries and regions means that validated testing in one country may not necessarily deliver compliance in another.

A good example of this is in the UK, where fire testing is currently undertaken to British Standards (BS). In 2013, the country will be required to comply with European (EN) testing standards. In this instance the assumption is that if a fire glass product or glazing system has been shown to meet 30-minutes fire integrity and or insulation with BS, that it will achieve that against the new EN testing.

Due to the differences in testing procedures in Britain and Europe, this is not the case. Current fire testing protocol in the UK leaves the thermocouples in the testing furnace exposed. In contrast, EN testing techniques encase the thermo-couples in a ceramic and steel plate, which is intended to standardise heat detection across different types of furnace. Such standardisation should ultimately ensure more reliable test results and consistency of product performance throughout Europe. However, as it results in a more intense period of heat that was not present during BS testing, systems that currently achieve compliance may not reach the same integrity levels.

Due to the differences in testing procedures in Britain and Europe, this is not the case

This example illustrates the importance of understanding the testing procedures that are undertaken between countries, particularly when exploring the potential for specifying fire glazing products from overseas.

Putting theory into practice

Pyroguard fire safety glazing has been installed at two new Royal Shakespeare Company (RSC) theatres in Stratford-upon-Avon. The much celebrated Royal Shakespeare and Swan Theatres have benefitted from high performance integrity and insulation glazing in fire doors throughout the development.

EI glazing was specified at 23mm and 15mm thicknesses to deliver 60/60 and 60/30 fire ratings respectively. Used as part of an internal fire door system, the product was required to deliver integrity and insulation performance for slim vision panels. The fire glazing challenge for this project was satisfying the UK building regulation requirements without compromising on the build schedule. Pyroguard met the necessary performance specification and could be delivered to site as bespoke cut sizes in a short space of time.

A new Extra Care development in Carlisle, UK, will benefit from superior levels of fire protection following the specification and installation of Pyroguard EI 30 INT – a high performance integrity and insulation glazing product.

The development at Heysham Gardens in Carlisle will provide 60 mixed tenure homes, principally for over 55's who require some social care but wish to remain independent in their own homes. To ensure compliance with the UK's Part B fire safety regulations, architects specified Pyroguard EI 30 INT, to ensure the required levels of fire protection could be achieved with screens in the communal area. Philip Brooks, of architects Day Cummins, explains: "Good day lighting and sightlines are key drivers on this Extra Care scheme. This can enhance visual recognition for those with failing eyesight or dementia, and can reduce reliance on artificial lighting. The fire glass helps to achieve these aims and ensures fire protection requirements are met."

The fire glass was also installed at fixed sidelight panels next to fire doors, including flat entrance doors. The size and weight of the panels demanded that Pyroguard be installed on-site. By delivering the glass to site cut to size, the contractor was able to efficiently construct the glazing system. **APF**

Simon Ellison is Technical Manager for Pyroguard at CGI International

For further information, go to www.pyroguard.eu

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Vehicle Extrication Explained

To varying degrees, road deaths in relation to population size in the developed countries have fallen fairly consistently for many years. The improvement in road safety generally has obviously been a major factor, but so too has the speed in which injured casualties can now be extricated from crashed vehicles.

Klaus Geerissen

Lukas Hydraulik

In some cases, it is possible to extricate a casualty from a crashed vehicle without having to resort to cutting the vehicle. However, in high-impact crashes, it is rarely the case that the casualty can be removed via the side door or another part of the vehicle. In such cases it is necessary to use mechanical and hydraulic vehicle extrication techniques to gain access to the trapped person and effect his or her safe removal.

Put simply, vehicle extrication is the process by which the vehicle is removed from around an injured or trapped person who has been involved in a motor vehicle accident. It is used when, due to the nature of the crash, the entrapment of the person or the nature of his or her injuries make it impossible or unadvisable to utilise conventional means of exit. Clearly, great care has to be taken to ensure that the extrication process itself does not cause further injury to a casualty, the nature of whose injuries may not yet have been fully ascertained.

There is a well established sequential procedure that involves five essential steps:

1 Protection of the accident scene, to avoid any risk of further collision and to remove or at least make safe any other hazards. This will involve using absorbing powder on any spilled oil or petrol.

2 Patient triage – establishing the degree of urgency of medical attention.

3 Securing the vehicle to prevent movement during the extrication process that may otherwise result in further injury to the casualty or rescue personnel.

4 Providing access to the vehicle to allow a first responder to better assess the patient and begin medical care.

5 Removal of one or more sections of the vehicle to allow the safest possible removal of the accident victim.

The extrication process

Depending on several factors, including the nature of the crash, the damage to the vehicle, the likely injuries sustained by the casualty and the degree of an entrapment, there are several extrication

techniques that can be adopted and a variety of high-performance hydraulic tools that can be brought into play.

First though it is important to place all of the rescue equipment on a tool station to ensure that everything is readily to hand. This is not just a matter of neatness; it is the only way to ensure that everything is to hand when it is needed. It also ensures that the rescue personnel are not put at additional risk by having equipment lying around for them to trip over.

An equally important prerequisite to extrication may seem rather obvious, and that is the need to explore the situation – the crashed vehicle, access, working space and other threats and hazards – and establish contact with the casualty. At the same time, the vehicle's battery should be located and disconnected.

Accessing the vehicle

One of the primary access points on a vehicle is via the real window.

This is achieved by securing the rear window with bonding sheet to protect the casualty and the rescuers from flying fragments or splinters of glass. The window is then smashed using a window punch and removed, and a protective covering is placed over the bottom of the window and the vehicle interior to enable a member of the rescue team to gain safe access to the vehicle.

This medically-trained rescuer checks and communicates the critical injury status of the casualty and provides any essential treatment or limb support in readiness for safe removal.

Removal via the front window requires the cutting and removal the laminated safety glass windscreen. It is then necessary to either remove or lift the interior plastic panels to expose the hybrid gas generators and structural pillars enhancements.

A more advanced first access option is to remove the rear hatch door, remove the rear seats from the vehicle and, if possible, axis-controlled rescue the trapped person.

Advanced access techniques

To gain side access, the driver or passenger door removal can be achieved by creating a door gap to remove the door from the hinged side by cutting through the front wheel arch. The gap between the door post and the door is then enlarged using a hydraulic spreader, the hinges are cut through the door is removed.

Where it is necessary to remove the entire side of the vehicle, the rear window is spread using a hydraulic spreader to create a door gap, and the door is opened with the spreader. The B post between the front and rear door is then cut at the bottom and top and is ripped off using the spreader, exposing the entire side of the vehicle.

To gain the maximum access to the vehicle it is necessary to remove the roof. This should be started at the rear of the vehicle by cutting the C and D posts on both sides of the car. The B posts should then be cut or, alternatively, ripped off using a rescue ram. The front A posts are then cut enabling the entire roof to be removed.

Where it is necessary to expand the vehicle's footwell, the rescue ram technique should be utilised, making a deep relief cut at the bottom of the front A post. If necessary, reinforcements at the centre consul need to be laid open and weakened, prior to pushing away the vehicle front with a hydraulic spreader. An alternative is to use the spreader technique whereby a footwell window is created by two cuts enabling the spreader to be inserted. Two parallel relief cuts are made at the frame rail and the front of the vehicle is pushed away using the hydraulic spreader. **APF**

Lukas Hydraulic has produced a poster with the assistance of the Nuernberg Fire Brigade showing several methods of casualty extrication. It is freely available to fire and rescue services worldwide from Lukas distributors.

Klaus Geerissen is Regional Sales Manager Asia and Head of LUKAS/Vetter Training Department

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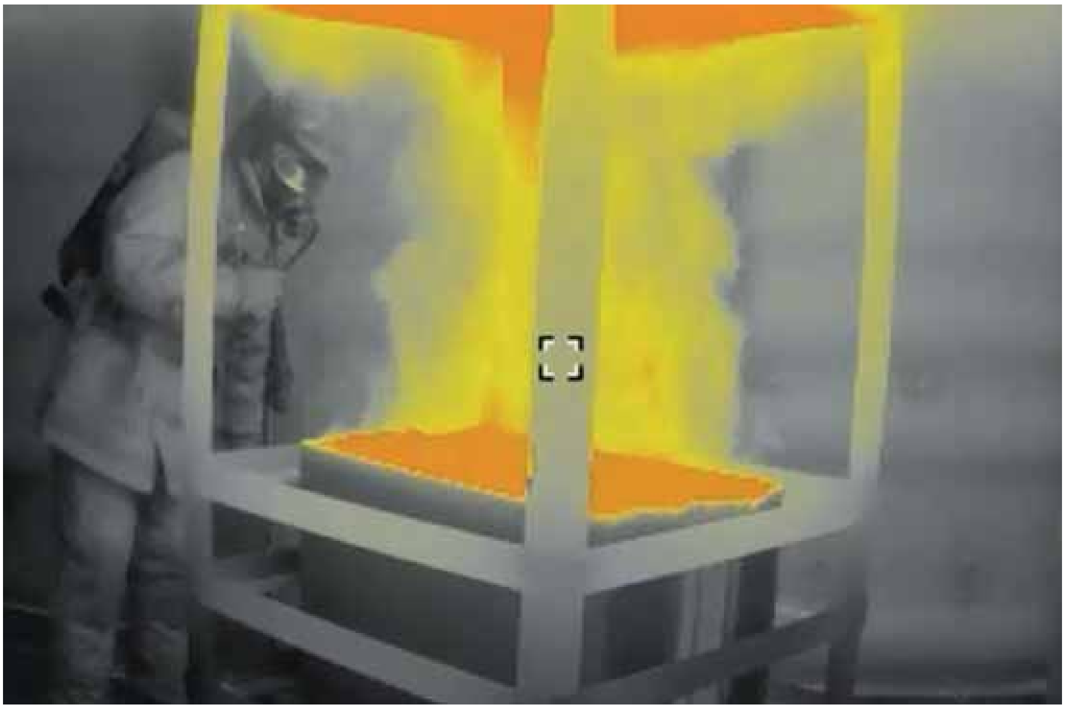

Angus Drummond

Argus Thermal Imaging

Testing Times

Taking decisions on which thermal imaging camera to buy can be a high-risk strategy if you rely on sales brochures and specification sheets to tell the whole story. There is only one sure-fire way to make the right decision and that is to hands-on test the shortlisted cameras against your own purchasing criteria.

While technical advances that improve firefighter safety and boost the survival prospects of casualties trapped in burning buildings or confined spaces following a natural or man-made disaster are to be wholeheartedly welcomed, thermal imaging has become one of those areas where it is quite possible to get carried away with the latest technology for its own sake.

Take for example, the move from 160 format sensors to 320 format sensors. Argus Thermal Imaging is often being asked if it will go to 640 format, in the mistaken belief that this alone will enhance the image resolution. The reality is that sensor technology has moved on, and the size of the sensor is no longer the sole influencing factor. In fact, we have recently re-introduced a 160 sensor that is a significant improvement over larger format sensors on the market. However, there are camera buyers who subscribe to the idea that bigger must be better – a view readily exploited by some manufacturers – without asking the question: "Is this what I need in a camera for my applications?"

Technical advances in thermal imaging must have a genuine applications benefit or they are doing little more, as in the case of merely increasing the resolution, than adding to the cost of the cameras and allowing the manufacturer to promote a more glossy specification. Another area to which careful thought needs to be given is the temperature in which the camera will operate. Having a camera capable of operating a temperature that is not humanly survivable is valueless and, again, merely adds to the cost of the equipment. In such cases, all the promoting manufacturer or camera supplier is doing is attempting to make a virtue out of a valueless feature.

Establishing whether the technology is worthwhile and has real, measurable benefits can be achieved only by taking two steps that are vital if the most appropriate purchasing decision is to be made – there must be a clear understanding of the applications for which the camera will be used, and hands-on testing of shortlisted cameras is the only way of ensuring that the selected camera is the best one for the job.

Evolution of Thermal Imaging

While the relatively recent introduction of the personal thermal imager, whereby every firefighter has his or her own thermal imaging camera has become a popular talking point, arguably the most important developments in recent years have been first, the highly successful introduction of cameras that store still images for later analysis, followed by cameras that store video images. Both developments were pioneered by Argus and first reached the market in Argus thermal image cameras. The importance of these developments lies in their irreplaceable use in training firefighters and rescue specialists.

The latest development is the integration of telemetry that enables remote, wireless access to live images and video footage. This is a major step

forward as it means that, for the first time, officers commanding a fire scene have visual simultaneous access to what is happening outside the building and inside the burning building or collapsed structure. In short, they are no longer "managing in the dark". Via satellite, these images can also be accessed anywhere in the world, which may be of immeasurable help in natural disasters where specialist help may come from a far-distant country.

This technology is being offered by a number of manufacturers, but the performance of individual systems varies widely, underpinning the imperative need to test equipment before making a final purchase decision. Technical difficulties and frequency-band interference mean that the effectiveness of this telemetry on some cameras on the market that use standard technology is limited to something like 100 metres. By comparison, Argus cameras have been tested successfully by London Fire Brigade in the London Underground and have shown to be reliable three floors down. Similar tests have confirmed that they are equally reliable 15 floors up a multi-story building. This is due to Argus' use of technology developed for front-line military applications and the adoption of advanced COFDM (Coded Orthogonal Frequency Division Multiplexing) technology.

Fit for purpose

Any thermal imaging camera must be fit for its intended purpose. This might appear to be a statement of the obvious, but thermal imaging technology and its application are not as widely understood as might first appear. An example of the need for this care is where thermal imaging cameras will be used in ARFF (Aircraft Rescue and Fire fighting) operations, where the equipment may also be used to check the condition of aircraft tyres, brake pads, and be used for smoke detection. Increasingly, thermal imaging cameras are also being utilised by other members of the emergency services at the scene of an incident, taking their use beyond the usual realms for firefighting.

Part of the problem is that, in some ways, the adoption of thermal imaging within fire and rescue services around the world has gone down the same path as that trodden by SCBA (Self Contained Breathing Apparatus). While in many countries thermal imaging has now been fully embraced for firefighting and USAR (Urban Search and Rescue) operations, there are a number of countries still to embrace the technology – often due to financial constraints – just as there are countries that have yet to invest in SCBA equipment.

Hence, the level of awareness and understanding varies from country to country. When "catching up" this can lead to hasty decisions being made; manufacturers' sales literature can

mistakenly be taken as telling the complete and accurate story, or equipment can be adopted solely on the basis of its being used by other fire and rescue services.

Setting the standard

Much has been written recently about standards and, in particular, the USA's National Fire Protection Association's NFPA 1801: Standard on Thermal Imagers for the Fire Service. This standard has the laudable aim of specifying the design, performance, testing, and certification requirements for thermal imagers used by fire service personnel during emergency incident operations. In fact, it is quite possible to see thermal cameras promoted as complying with this Standard. But this is not the case. There is not a camera currently on the market, including the Argus cameras, that complies because right now it is impossible to claim compliance as the NFPA is still endeavouring to establish a replicable test for image quality for what is widely acknowledged to be the most technical standard ever introduced by the NFPA.

So, while NFPA 1801 is to be welcomed and will surely ultimately be a major step forward, we are not there just yet. The current testing dates are unknown, and until individual thermal imaging cameras are tested, claiming compliance is nothing short of incorrect and misleading. A clear implication of this is that any claims made for any camera purporting to comply with NFPA 1801 must be suspect, again reinforcing the argument for hands-on testing.

Establishing the shortlist

When selecting thermal imaging camera companies for inclusion in a shortlist of potential suppliers there are a number of criteria that ought to be considered before a company is added.

For example, there is no real substitute for knowledge and experience and this is most likely to be found in a manufacturing company that specialises in thermal image technology, rather than one that sells a portfolio of fire and rescue equipment such as gas detection devices, breathing apparatus and personal protective clothing. The reality is that a company can be truly expert in only one field, and it is best if that area of special expertise is in thermal imaging. Selecting an established supplier is another consideration, because reliable technology is not easy to fast-track and newcomers tend to always be behind the established innovators in the market. Argus cameras are based on 30 years of innovation and feedback from the fire-fighting community.

Before selecting a thermal imaging camera there must be a clear understanding of the applications for which it will be used, and hands-on testing is the only way of ensuring that the selected camera is the best one for the job.

Test, test and test

Clearly then, the only reliable way to reach a decision on which camera to select is by testing the equipment in the circumstances you anticipate encountering.

This, and only this, will enable essential features such as the camera's ruggedness, its image capture and image quality to be independently established in the real working environment. Only testing will show if the waterproof claims being made for the camera are accurate, and it is only by using a thermal imaging camera in a real fire is it possible to see if it has the ability to see high and low temperatures at the same time, or if the heat intensity is more than the camera can handle and so takes over the entire screen. This is particularly important in rescue situations where the camera may be focused on an area that contains both high-heat flames and the body of a relatively low temperature casualty.

Testing even allows seemingly mundane features to be assessed, such as ease of use in stressful emergency environments, and whether the different language options – Argus cameras, for instance, now incorporate 18 languages – are easily accessible and readable.

Thermal imaging cameras play a major role in improving firefighter safety and users are constantly being asked to work in ever more dangerous environments as the recent earthquakes in New Zealand and Japan and the explosion and fire at the Fukushima Daiichi nuclear plant bear out. We owe it to them to provide the best possible equipment; to place in their hands cameras that have been tried and tested and not merely chosen from a brochure or specification sheet and that represent good value for money. It is a case where, certainly, one size does not fit all. **APF**

Angus Drummond is Business Manager at Argus Thermal Imaging

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HazMat Response and the Need for Training

Steven Gregory McLeod

Fire and Safety Australia

HazMat response is one of the most difficult types of emergencies faced by fire crews as hazards are often invisible and scientific advice may be hard to come by.

HazMat emergencies are typical 'hurry up and wait' scenarios, where personnel will proceed to the incident quickly under lights and bells and then wait until sufficient information is gathered before exposing crews to a variety the hazards associate with a HazMat emergency.

To reduce the likelihood of fatalities and injuries to your firefighters, you must equip them with an understanding of their local 'typical' HazMat emergencies. This includes looking at local industries and deciding what HazMat incidents are most likely to occur within the local area. By informing your fire crews of the typical HazMat emergencies that may occur and by training them in the types of incidents that may arise, your personnel will be able to respond safely and professionally to any HazMat incident.

Types of incidents

Hazard identification is part of the daily emergency response activities of fire crews worldwide. We are used to going to spilt petrol, or the occasional more dangerous chemical. However, HazMat emergencies can present real dangers to fire crews, especially when life hazards are involved.

Whilst life hazards are the most concerning, exposures may include nearby buildings, structures and workplaces and the personnel that occupy such buildings. So, when completing your size-up consider at least:

- What nearby buildings, facilities and homes may be affected?
- What is the 'worst case' scenario?
- What is the 'best case ' scenario?
- What precautions must your fire crews take to ensure their own health and safety?

However, HazMat incidents are extremely difficult to size-up as often the incident commander has little operational experience with the specific type of chemical concerned. HazMat incidents are best characterised as 'the unknown' and must be respected and treated as such. Often fire crews respond to a variety of incidents involving HazMat emergencies; however fire crews may not consider the specific hazards and risks that HazMat emergencies may cause.

A HazMat example

At 0900 hours you are responding to an unconscious worker with liquid spilt all over him as a result of a 44 gallon drum overturning. You arrive at the scene to find a man in his 40s who appears to be unconscious. What do you do and what hazards do you consider?

What caused the worker to collapse? What hazards could be within the immediate area? Do you have to consider evacuation? What hazards may affect your firefighting crew? Should you proceed with a 'snatch rescue' without identifying the chemical? What about the casualty? Should you do anything before identifying the chemical?

The situation described above is uncommon; however in my experience I have never in my career encountered a simulated situation that has caused more indecision and more argument. Many fire crews would wait until further information is received, however many others would complete a 'snatch rescue' as this would be safe in 90% of occurrences. So, what do you do?

This is an example of how HazMat emergencies can be presented to fire crews outside of a typical and normal 'HazMat emergency'. If you are responding to a HazMat emergency, do all crew have the same view, or a different view? Do all crew members appreciate the responsibility that is incumbent upon the incident commander? Do all crew members start to consider the hazards of the scenario or emergency en-route?

Many fire crews would wait until further information is received, however many others would complete a 'snatch rescue' as this would be safe in 90% of occurrences.

In emergency callouts such as this, if fire crews are not well trained in what the consequences of an incorrect response are, they may be at risk of an injury or fatality. The example above is a dangerous situation that may cause crews to be at risk of serious injury if normal standard operating procedures are not followed. So, let us consider the above example; what hazards may be present and what control measures should be considered.

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PATENT PENDING

PATENT PENDING

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INTERFRON SpA

Typical hazards for the above scenario include, but are not limited to:

- **Chemical composition.** What type of chemical could this be? What would the potential consequence be? What is the worst case scenario? All of these situations demand immediate and specific controls. But what is your decision?
- **Exposures.** What exposures are present in this scenario? Are buildings or personnel affected? What actions can we take to limit the damage? What can we do to limit the number of people affected by this emergency?

The example should illustrate to those of us that are well trained in incident leadership that the situation should be 'sized-up' and appropriate control measures should be utilised based on the emergency at hand. Realistically we should consider several active control measures for each of the hazards outlined above. Consider the following to be the absolute minimum that should be implemented prior to allowing any firefighter to attempt a rescue of the injured person:

- **Gas Test.** A gas test should be performed across the area to detect any chemicals that are IDLH (Immediately Dangerous to Life and Health).
- **The chemical.** The UN Number, HAZCHEM Code and the chemical description should be considered before any rescue attempt is made. This is to determine what the chemical is, what damage could occur and what the hazards are to fire crews.
- **Containment Area.** What can we do to contain the situation? How far out should we barricade? What can we do to limit the spread of this chemical?
- **Local Authorities**. How can we utilise local authorities, such as the police, ambulance and local council to limit the spread of this emergency and keep the local community informed about the progress of this emergency.

Wherever possible, on arrival seek out local knowledge and help as soon as practicable to assist in your size-up.

While many firefighters may consider the control measures above, taking responsibility for the actions that you take as a crew leader is a different matter. The safety of our firefighters is our number one priority, so do not let a chemical spill determine the safety of front-line personnel.

HazMat and local knowledge

Fire crews may receive an emergency call for a HazMat emergency and find themselves at a site with a multitude of hazards to consider and with no real technical knowledge of the site, the chemical itself or the surroundings.

Wherever possible, on arrival seek out local knowledge and help as soon as practicable to assist in your size-up. Track down local workers who have knowledge about the specific hazards that may be present before any action is undertaken. Question the local people about at least the following:

- What are the hazards associated with this chemical?
- How long has the person been unconscious for?
- Has a gas test been completed of the area and what were the results?
- Could the chemical be affected by wind?
- What do you think has caused this incident?
- What should we consider prior to rescue?

The answers to these questions will often provide you with valuable information about the emergency and may cause you to either complete a rescue or wait until the conditions within the area of the incident have been made safer.

Localised and specific HazMat training

Fire crews are experienced in utilising SCBA and atmospheric monitoring equipment at fires and

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incidents, however do fire crews understand what local HazMat emergencies could present within their local area?

Fire crews will often have limited experience in rescuing personnel from HazMat incidents, as they occur rarely. However, when was the last time that your personnel completed HazMat drills that focussed on your local area and industry? The truth is that many urban fire brigades do not complete such drills. They believe that industry does not want them within their workplaces. My experience is that nothing could be farther from the truth. Often, personnel in industry feel 'lost' when it comes to HazMat emergencies and most are only too happy to have their local fire brigade come and complete a rescue drill or HazMat scenario.

We need to train in environments that are as realistic as possible. Whenever possible involve your local industry and train your firefighters in the types of rescue that are most realistic within your response area.

After instructing HazMat Response and rescue for over five years, I often hear prospective clients who want advice and assistance from their local fire brigade and will only be too happy to include you in their drills and simulations. By involving your local industries in emergency preparation, you will feel more comfortable with this challenging and often dangerous type of HazMat Response.

Summary

HazMat Incidents are challenging incidents as they often involve the unkown. For this reason, fire crews needs to practise the 'possible' rather than just the 'norm' to ensure that they are ready to encounter the types of emergencies that are possible within their local area. For fire crews to attend HazMat Incidents, they must ensure that they understand the local industry and the types of HazMat incidents that may occur. **APF**

Steven Gregory McLeod is Managing Director of Fire and Safety Australia Pty Ltd

For further information, go to www.fireandsafetyaustralia.com.au

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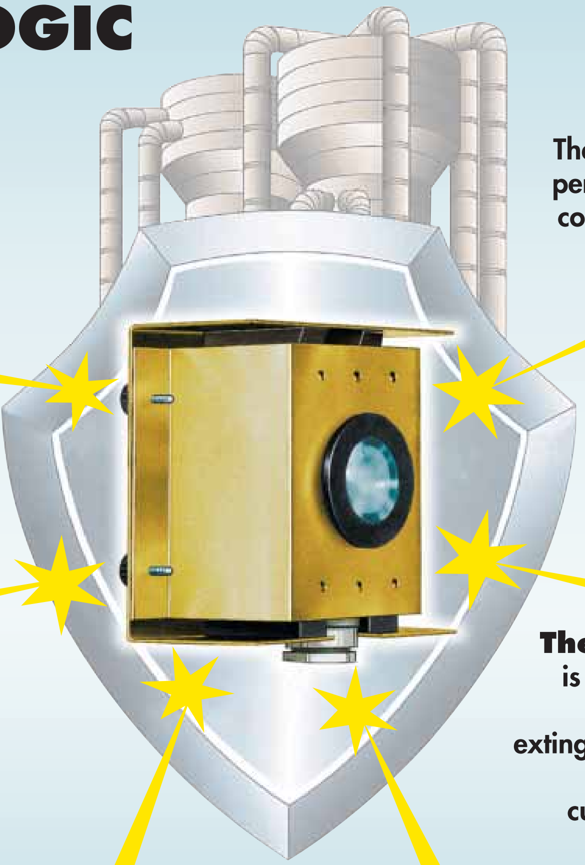

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Understanding Po

Andrew Shiner

IDEX Fire Suppression Group

The portable fire pump performs an important role for the modern fire fighter and is truly integrated as an essential tool in fire service equipment.

Portable pump uses can be summarised as being: to supply water from open sources to main vehicle pump; a firefighting pump in the frontline; an economical and versatile firefighting pump for low-cost truck build; and as a hydrant system feed.

The first step in the life cycle of a portable pump with a modern fire service is its selection, and the informed pump user will follow a rigorous selection process to ensure they are acquiring the optimum solution for their needs.

Depending upon the application, there are several key variables to consider when selecting a suitable and reliable portable pump. First, ascertain the actual flow and pressure performance needed at the end of the discharge hose in relation to the nozzle used. Second, determine the number, length and diameter of discharge hoses and suction hose normally required. This will help calculate the friction loss from the water source to the pump and from the pump to the end of the discharge hoses. On the suction side, is there a positive pressure water source (like a pressured hydrant), or is the water being lifted from an open water source? When drafting, it is important that the portable pump has enough lift capacity to fit the application.

Additional factors to consider are the elevation at which the equipment will be used, available space on the apparatus for transportation, service methodology, product reliability, fuel type available, ease of use, manpower available and transportation.

Portable pumps can be constructed to perform in pressure or volume application. The pressure applications are for situations where water needs to move to higher elevations or longer distances. The volume pumps are applied where higher flows of water at lower pressures are required. Situations where volume pumps maybe used are when refilling a tanker or portable tank, or to manage flooding.

The range of portable pumps available to the market is wide and varied and performance is related to the power unit driving the pump. Other factors such as size, weight, compactness, user features and options need to be the best available.

There are increasing demands for a portable pump to be lighter, more compact and yet still give powerful and reliable performance. In addition, the space available in vehicle compartments becomes more restricted as fire trucks need to carry a greater variety of equipment to cover all potential problems, while vehicles become smaller to manoeuvre our ever crowded streets.

Pump standards

The equipment must conform to the appropriate standards. In Europe it is the EN14466 standard that primarily addresses health and safety aspects as well as important pump features, such as operator controls and instrumentation. In the United States the portable pump performance criteria has been established by various agencies.

The United States Forestry Service (USFS),

rtable Pumps

Bureau of Land Management (BLM) and Department of National Resources and Conversation (DNRC) manage their own portable pump specifications. The National Wildfire Coordinating Group (NWCG) has set portable pump specifications to increase the ease of interoperability between the various central government and local state wildfire agencies. Ultimately each of these agencies has developed their specifications to address the safe fire suppression needs applicable to their terrain.

In Europe portable pump design and manufacture is subject to the standards devised by CEN (Comité Européen Normalisation), and these standards were devised by a technical committee, CEN/TC 192, that comprised leading European pump manufacturers. The current definition of a portable pump is given as: "Portable pumps are motor pumps designed for firefighting that can be transported by hand to the site of operation and that are driven by a combustion engine. Portable pumps are not intended to be permanently mounted in firefighting and rescue service vehicles.

This European standard deals with significant hazards, hazardous situations and events arising from portable pumps used as intended or arising from conditions foreseen by the manufacturer or the manufacturer's authorised representative. It addresses the construction, setting, and operation of the portable pump.

In-use performance

Although lightness and compactness are high priorities, durability and a high build quality must not be compromised. The pump must perform immediately and at the full rated performance every time it is needed. On the front line of firefighting there is no second chance! The engine must be simple to operate and, once running, the pump should be easy to prime and use. The engine can be started by a small electric motor, powered by an onboard battery, or by a hand pulled starter – users often prefer to have both fitted, electric start as the first choice and the recoil as backup. Features such as pump priming can be either hand pump, exhaust gas, piston or vane type depending on the user's preferences.

A wrap-around stainless steel or aluminium frame ensures that the unit is not easily damaged yet, at the same time, is easy to manoeuvre. On the larger portables, either integral wheels for local manoeuvring or a separate detachable wheel assembly for longer transportation are often available as factory-supplied options. These frames are normally fitted with adjustable handles that can, in some cases, be extended to ease carrying the unit.

Power packs

Pump manufacturers are improving their relationships with the engine suppliers, to ensure that users can expect a comprehensive service for all spare parts and repairs. To achieve this, pump manufacturers select engine suppliers with a comprehensive distributor network in all of the countries in which their pumps are operating.

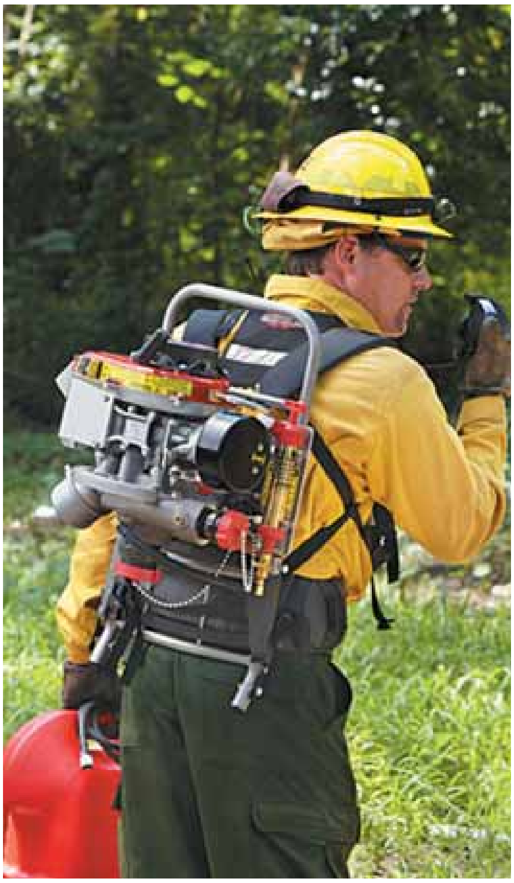
The typical power source for a portable pump is a lightweight petrol or diesel engine of the smallest physical dimensions and weight, but reliable and easy to operate. These are often air cooled at the lower end of the power scale. 15kw four-stroke engines are preferred usually because of the reliability, lower emissions and ease of operation – there is no pre-mixing of fuel and oil required.

Bigger engines are needed for the larger capacity portable pumps but again weight and size are key features that need to be considered. With these larger engines it is often necessary to select closed-circuit water cooling, where a water-to-water heat exchanger replaces an air-to-water radiator system and so gives significant weight savings with no reduction in cooling efficiency. Closed-circuit cooling systems are preferable, as these do not discharge water into the ground around the pump, causing the area to become subject to water logging or freezing in adverse weather.

Safety is as always a high priority with particular attention focusing on the engine exhaust, which must be fitted with a guard to protect the operator from high temperatures

Portable options

Due to the inherent weight of diesel engines, it is unlikely that portable pumps above the smaller sizes can really be called portable units, but when mounted permanently on a small forestry-type fire truck, the diesel weight becomes less of an issue. Another option is to mount the diesel engined pump on a small trailer, so ensuring mobility without compromising the required performance.



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But all portable pumps, diesel or petrol engine, can become a permanent fixture on small vehicles if the need arises. This example shows a Godiva 8/5 portable pump as part of a small truck Greek firefighting unit. The pump is fed from an onboard tank and supplies a small monitor.

As a contrast, the smallest and most portable pumps are the floating models, designed for use in remote rural areas where rivers or ponds are often the only source of water. Typically these floating pumps feature a single cylinder, two-stroke engine mounted on a high-strength polyethylene float and can produce up to 500 litres-a-minute discharge with self priming.

Hale Products in the USA produce a "back-pack" portable pump called the Fyr Pak, this now includes electric start as an option, making pump operation much quicker. This is ideal for wildfire type situations.

Fuel availability is also an issue – petrol units are lighter than diesels but if diesel is the only available fuel then this dictates the engine type. Servicing of the pumps should be straightforward and the manufacturer's warranty is expected to be at least 12 months duration.

Another aspect of portable pump design is durability, and pump manufacturers are taking steps to ensure the materials used have increased life expectancy. For example Hale & Godiva offer all their portables with apticote coating to protect the lightweight aluminium from corroding in

adverse environments. Portable pumps also now incorporate a high level of instrumentation, controls and optional lighting masts. The lighting mast is a useful addition as often, particularly when relaying, the portable pump is located away from the main area of operation and likely to be located in an area where night time illumination is unavailable.

Meeting the market's needs

It is essential for the pump manufacturer to consult the end user from the early stages of new product development to ensure the pump meets, and where possible exceeds, the firefighter's requirements. The pump manufacturers and the main professional organisations are regularly in contact through conferences and exhibitions for feedback and discussion on pump specification improvement. "Voice of the customer" surveys are routinely arranged with customers.

Progressive pump manufacturers are also always researching different aspects of pump performance to see where efficiency can be improved. In general, the overall strategic aim is to produce lighter, more compact but also more powerful pumps. A typical example of this is the development of the Godiva Powerflow 8/5 Twin portable. In response to a brigade request for two discharge outlets, Godiva adjusted the design to incorporate this feature with minimal change to the pump configuration, providing more operational flexibility for the firefighter. Hale Products is now offering the latest Briggs, Kubota and Honda engines as power sources for their higher performing portable pumps.

The performance and standard of portable pumps available for firefighters today continues to improve mainly due to the combination of customer's expectations, improved technology, competing manufacturers and the introduction of exacting industry standards. Portable pumps remain a key and powerful part of the fire fighters armoury to ensure flexibility of operation under demanding situations. **APF**

Andrew Shiner is Vice President of International Sales & Marketing at IDEX Fire Suppression Group

For further information, go to www.godiva.co.uk or www.haleproducts.com

Swiftwater Trainin

Paul Hurford

AFire

Australian firefighters, in Cambodia to help train the country's emergency services, turned training into reality when hundreds died in a tragic end to Cambodia's famous Water Festival.

Cambodia has seen more than its fair share of tragedy; during the Pol Pot "Killing Fields" period between one million and three million people died. Today, it is a land striving to improve the lives of its people, a task being aided by volunteers from Australian Firefighters International Relief and Education (AFIRE).

For the past five years, volunteer firefighters from AFIRE – a not for profit organisation – have given their time, energy and expertise to help train the Cambodian fire service, prior to which Cambodia's firefighters had received little, if any, fire and rescue training.

In late November last year, an AFIRE team comprising three Victoria firefighters – Ryan Miller, Tim Erikson and myself – had just completed a basic firefighting training program in three of the country's provinces. We had also conducted fire and emergency management training with one of the prime minister's body guard units. As it turned out, this training could not have been better timed as, within a week, tragedy struck the country once again in which both the newly trained Cambodians and the AFIRE team were destined to end up playing a major role in the rescue operation.

Water festival tragedy

Bon Om Thook, known outside the country as the Khmer Water Festival, commemorates the end of the country's rainy season and is celebrated in November. Every town and province joins in but the biggest celebrations take place in the capital, Phnom Penh. For three days, workers from every province join with the city's resident population to celebrate around the clock with boat races and concerts. The events attract several million people each year.

The boat race tradition is over a thousand years old and was originally a form of training and a means by which the king could choose his champions, similar to the way in which jousting tournaments were used in medieval Europe.

It is not unusual for three or four people to drown during the boat racing; however the 2010 races passed off without any boat race fatalities. Sadly, tragedy came to Phnom Penh when at least 345 people were killed and hundreds more were injured in a stampede on the pedestrian bridge linking Diamond Island in the Tonle Sap River with the mainland, resulting in the worst loss of life since the overthrow of the Khmer Rouge in 1979.

Many of the victims suffocated on the bridge as the crowd – which some reports suggest numbered thousands of people – surged back and forth on the 100-meter long bridge. Others drowned after jumping from the bridge into the water. The remaining people were left crushed together in a block of human bodies, estimated to be as dense as 17 people per square meter.

Significantly, AFIRE had provided water rescue training only days prior to the Water Festival and

g . . . Just in Time

Picture courtesy of Jialiang Gao

were actively participating in water rescue activities with the local authorities during the event. Water rescuers were able to use rescue equipment which had been donated by AFIRE, and skills learnt in the days prior to the disaster to remove people from the river. We were also able to utilise other items of equipment, including an automatic defibrillator that had been donated recently by Melbourne's Metropolitan Fire Brigade, while trying to free those still stuck on the bridge.

AFIRE response

The AFIRE team were notified about 30 minutes after the event occurred and were on the scene within 15 minutes. Initially we responded to reports that the bridge had collapsed, but when we arrived we were met by a scene of utter horror.

In a desperate bid to find survivors, we searched through piles of bodies, triaging those with any signs of life and removing the dead to allow us access to others. Automatic defibrillators and manual CPR were used on many of the injured. The Cambodian police did an impressive job of keeping people away from the scene and, from our experience working with the Cambodian emergency service, the response was good. The ambulance system was working efficiently in a transportation mode but, given the size and nature of the disaster, the response organisations in any country would have been challenged. Given that fact, the emergency response by all was as efficient as could be hoped for.

In fact, the cooperation of everyone on scene was huge. We have responded in an observation role to a number of major incidents in Phnom Penh and other parts of the country; crowd control is always a big issue, and the media can easily inadvertently obstruct the work of emergency service personnel. The Cambodian police did an excellent job; they, and some members of the media and public assisted by using lighting from the TV cameras to enable us and the Cambodians to work on casualties.

We experienced a really amazing response from everybody on the scene that we have not witnessed in Cambodia before. There was a real sense of desperation and a desire to do whatever anyone could to help the casualties. A lot of the guys were trying to do a hell of a lot of work, but felt helpless with the magnitude of the situation. Before the incident we had – fortuitously as it transpired – spent a couple of days training the prime minister's bodyguard in water rescue techniques, and so a lot of those guys responded as well and made a real difference to the outcome. Unfortunately, the Cambodian's do not recognise the emotional effects that such a tragic event has on these responders, and many were left trying to comprehend what had actually occurred, and why they were unable to protect their people.

AFIRE works only with the emergency service, mainly the fire service and water rescue, and with government agencies to create control and assistance management procedures. During that time there has been a big improvement on major fires in Phnom Penh and other parts of the country. Cooperation is certainly happening on a broader scale and the different agencies are working together better. It is just tragic that such an improvement had to be put to such a harrowing test. **APF**

Paul Hurford is Director of Overseas operations at AFIRE

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An MDM PUBLICATION
Issue 39 – September 2011

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ASIA PACIFIC FIRE MAGAZINE

REPORTING TO THE ASIA PACIFIC FIRE PROTECTION AND FIRE SERVICE INDUSTRY

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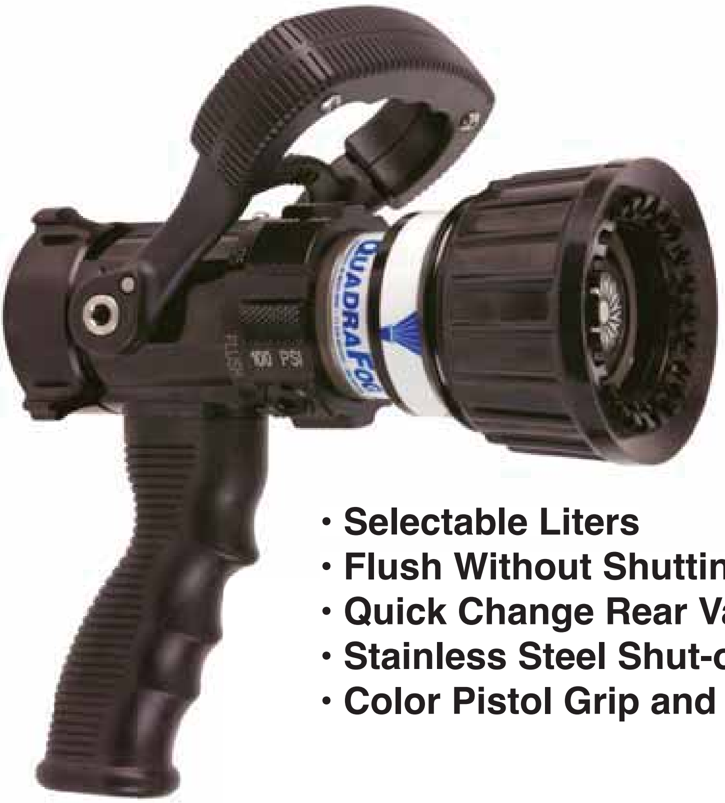

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**September 2011
Issue 39**

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Issue 39 – September 2011
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ASIA PACIFIC FIRE MAGAZINE
REPORTING TO THE ASIA PACIFIC FIRE PROTECTION AND FIRE SERVICE INDUSTRY

Front cover picture: Rescue workers from Japan walk past the Ambacan Hotel in the earthquake hit area of Padang, West Sumatra province. REUTERS/Nicky Loh (INDONESIA DISASTER ENVIRONMENT SOCIETY)

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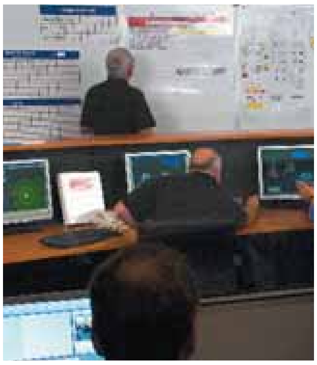
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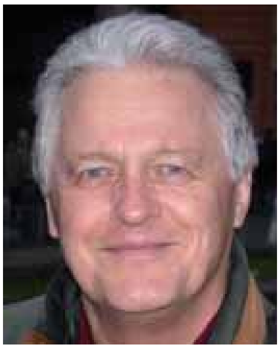

By Graham Collins

Pulling Together

There cannot be many readers of Asia Pacific Fire that have not recently being recalling the events in New York in 2001, the memory of which has undoubtedly brought to mind the all too recent earthquakes in New Zealand, the earthquakes, tsunami and resulting nuclear disaster in Japan and the flooding and cyclone in Australia. In just the first three-quarters of this year there were also landslides in Malaysia and earthquakes in Burma, Indonesia, Pakistan and China. And that list is by no means exhaustive.

The reality is, of course, that nowhere is immune; nowhere is safe. As if to prove the point, just before going to press with this edition of the magazine a 5.8-magnitude tremor struck Washington DC in the USA. This is the first earthquake in the region for at least 100 years, taking the local population by complete surprise.

This raises a number of important points that those holding the fire protection and emergency purse strings – in the broadest sense – need to always keep front of mind.

Alongside acknowledging the pressure that the emergency services are constantly under across the Asia Pacific region and the need for constant vigilance and preparedness, investment in prevention and warning technology is vital if we are to have any prospect of reducing the likelihood of being taken off guard from "unexpected" disasters. Equally important is the need to provide adequate training and resources, and then ensure that this training is kept up to date with the latest technological advances and experiences gained during recent disasters.

It is always encouraging to see often much needed help arrive from other corners of the world when disaster strikes. However, while this has an undoubted benefit and must surely boost the moral of the indigenous hard-press rescue workers, anecdotal evidence at least suggests that while their courage and dedication is beyond question, there is scope for closer cooperation and greater integration.

After the catastrophic earthquake in Haiti I spoke with the team leader of one country's contingent that had travelled across the world to help. While he was full of praise for the unstinting efforts that had been made by everyone, he felt that even more could have been achieved if there had been a more consistent and orchestrated approach. He cited the challenges of teams arriving comprising just two or three people and with a lack of proper equipment, poor leadership and even instances of limited experience in rescue operations. The effect of this was, on occasions, confusion and delayed operations.

It is clearly not practical to expect every fire and rescue service around the world to use identical equipment. Apart from any commercial considerations, some nations simply do not have the financial resources for this to be an achievable option. Similarly, local conditions vary widely, so the bank of experience is going to differ between one team and another. Nevertheless, is there not scope for establishing an international equipment, knowledge and experience benchmark for rescue personnel so that rescue teams converging on a natural disaster can "hit the ground running"?

Perhaps it will be pointed out to me that organisations already exist that have this aim? If so, then collectively we may need to do more to provide them with greater support and publicity to ensure that their goals are achieved. For its part, Asia Pacific Fire will continue to endeavour, through its editorial pages, to disseminate information on new equipment, experiences and techniques. It will also continue to provide a platform for those "at the sharp end" of firefighting, USAR, confined space rescue and CBRN operations who wish to share their experiences and knowledge with others. If you have something to contribute to the debate, drop me an email. graham.collins@mdmpublishing.com APF

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Electric Vehicles: Safety and More

James M. Shannon

NFPA

In his State of the Union address this year, the United States President, Barack Obama, declared his commitment to having a million plug-in or advanced-technology vehicles on the road by 2015. In order to achieve this ambitious goal, the Administration is proposing, among other measures, a $7,500 rebate for electric cars and a grant program to help communities with infrastructure including charging stations.

The United States, China, and Europe have placed big bets on the successful adoption of electric vehicle (EV) technology. And the stakes are not just a cleaner environment and less reliance on oil. The economic consequences for the American auto industry would be enormous if we are not able to successfully launch these new products in which billions of dollars and the hopes of so much of the industry have been invested.

The National Electrical Code will be a central document for proponents of EVs, and changes have already come into the new edition that address these developments. But they only scratch the surface of the safety issues that have to be dealt with for the introduction of this technology to succeed. When a development such as this takes place, NFPA cannot sit back and wait for the proposed code changes to arrive with the next cycle. We must look ahead, anticipate where the needs will be, and lead the way to ensure appropriate safety measures are in place.

The National Electrical Code will be a central document for proponents of EVs, and changes have already come into the new edition that address these developments. But they only scratch the surface of the safety issues that have to be dealt with for the introduction of this technology to succeed.

Last year, NFPA received a $4.4 million grant from the United States Department of Energy to create a program to train emergency responders on how to deal safely with accidents involving electric vehicles. We have worked closely with the automobile companies to begin the process of educating fire departments and other emergency responders about EVs. Working with Chevrolet and OnStar, we conducted training sessions around the Chevrolet Volt in six cities, and we are talking with other automobile manufacturers about how we might develop similar collaborative arrangements.

In addition to first-responder safety, massive infrastructure changes must be made to ensure adequate opportunities to charge automobiles in public places and commercial settings. We must consider how people can safely install quick-charging stations in their garages. There will be questions about fire protection in storage facilities containing large numbers of lithium and lithium ion batteries. We have talked to the Department of Transportation about the safe transportation of batteries by truck, rail, and airplane.

I have no doubt that all these questions will be answered, but the NFPA, along with the affected industries, enforcement officials, first responders, and the research community, must move quickly to keep up with the waves of new EVs expected to hit the streets in the years to come.

NFPA will stay ahead of the curve. We are reviewing additional fire protection concerns that will probably arise as hundreds of thousands of electric vehicles are sold in the United States over the next few years, and we are working with our technical committees on these issues. We are seeking government and industry support for research projects that the Fire Protection Research Foundation can undertake to answer some of the threshold questions crucial to EV technology.

This new effort is not limited to the United States. In collaboration with UL University, NFPA is looking into delivering its Electric Vehicle Training Program for Emergency Responders in various Asian countries. Earlier this month, NFPA introduced the Electric Vehicle training program at a China Fire Protection Association conference in the Shangdong province. As this new initiative moves forward, it is important to include the perspectives of our international constituents. We look forward to active participation from the fire service to ensure we meet the real needs of first responders worldwide. APF

This column originally appeared in the NFPA Journal® March/April 2011 and was reprinted with permission.

James M. Shannon is President and CEO of the NFPA

For further information, go to www.nfpa.org

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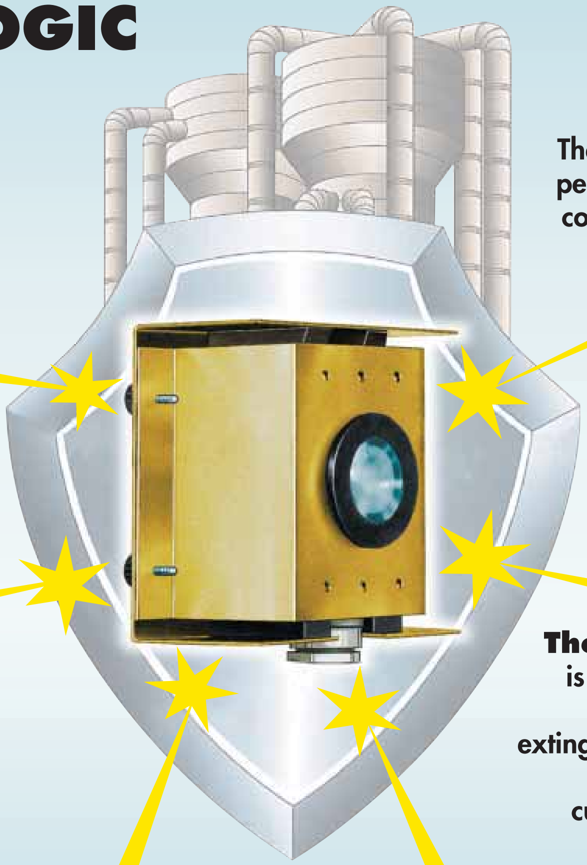
designed for dust collection systems to protect storage silos from the risk of fire.



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Stand-alone Technology Boosts Flame Detection

DRAEGER is claiming that its Flame 5000 explosion-proof, colour imaging based CCTV flame detector represents a significant development in flame detector technology. Designed as a stand-alone system and housed within a single unit, it combines colour imaging with digital signal processing and software algorithms to process live video images and interpret the characteristics of a flame. It is said to be ideal for use in oil and gas installations, as well as chemical and pharmaceuticals plants. It can also be used throughout industry wherever there is a potential fire source.

Unlike traditional radiation, or combined radiation and CCTV flame detectors, the Flame 5000 uses the camera to detect the flame and, Draeger says, can virtually eliminate false alarms. It can be used to provide live video images, or can be fully integrated with a control system or fire panel to provide fault and fire signalling using normal 0-20mA or relay outputs. As well as the surveillance benefits, this removes the need to despatch operators to investigate alarms, and reduces the risk of injury while improving response time to around four seconds.

It has a stainless steel mounting bracket that can be rotated to ensure optimum positioning, and the Flame 5000 can detect fires of 0.1 square metres or more, at 44 metres within a 90 degree horizontal field-of-view. An optical verification facility automatically checks the window for contamination and ensures that this field-of-view is not compromised by obstructions placed immediately in front of the detector. A built-in memory card allows the detector to record both before and after every alarm.

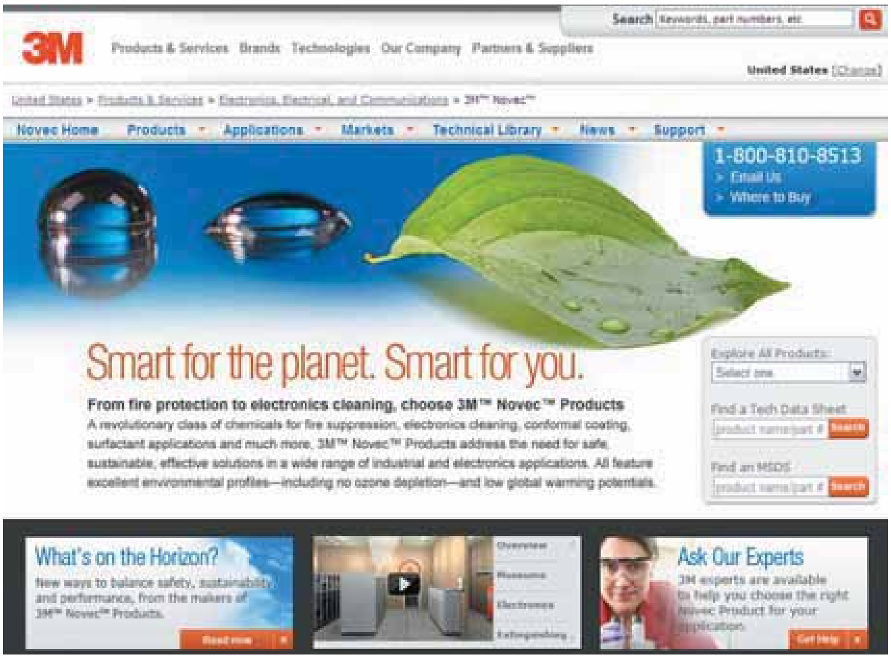
For more information, go to www. draeger.com

Website and Guarantee Enhancements

3M has recently launched a complete redesigned website for its Novec products, heralding it as being packed with a host of customer-requested features. It now includes a wider offering of technical information, process tips and application notes; it is also said to be "faster, easier and more intuitive" to use. There is also the option to sign-up to receive the Novec Horizons newsletter that includes updates on products and applications

The debate is still raging about the sustainability of some replacements for halon. However, 3M is so confident that Novec 1230 Fire Protection Fluid will continue to meet environmental and safety standards far into the future that if it is banned from or restricted in use as a fire protection agent due to Ozone Depletion Potential or Global Warming Potential, 3M will refund the purchase price of the Novec 1230 fluid. Citing it as "the industry's first global warranty against losses arising from regulatory action", this 3M Blue Sky Warranty is good for 20 years, and to qualify, a system must be registered with 3M within 30 days of system commissioning and every five years thereafter.

For more information, go to www.3M.com/novec1230fluid



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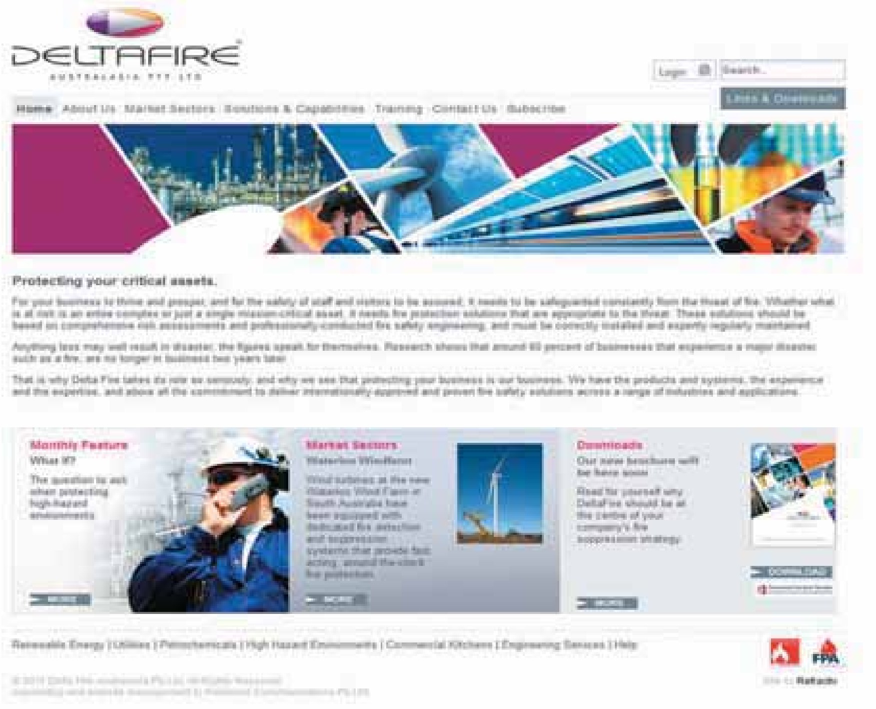
High-hazard Protection Resource

DELTA FIRE AUSTRALASIA has launched a completely redesigned website focusing on the protection of business-critical assets and high-hazard environments within the materials handling, petrochemicals, renewable energy, commercial kitchen and utilities sectors.

The new website also provides detailed insight information on a host of specialist protection, suppression, firefighting and rescue topics. These include: heavy vehicle fire protection; in-cabinet fire protection; wind farm turbine fire protection; foam concentrates and delivery hardware; and extrication and lifting equipment. Each month the site will include a special feature on a specific fire protection, suppression, firefighting or rescue topic. It will also include an in-depth look at a particular market sector or high-hazard application.

For more information, go to www.deltafire.com.au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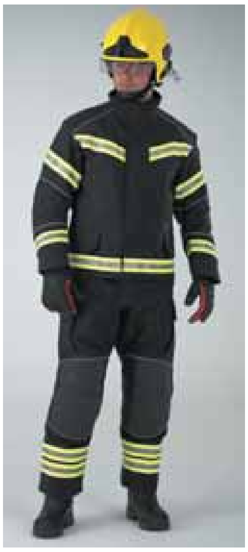
New PPE for Structural Firefighters



BRISTOL UNIFORMS is launching what it describes as "an innovative systems approach to providing structural firefighters with a range of mix and match options", stressing the benefits of comfort, ergonomic fit and composite flexibility as core features of its new XFlex range of products.

The XFlex system incorporates lighter weight features with a new range of fabric combinations all able to achieve EN469:2005 Level 2. This is said to have been made possible by the integration of an entirely new thermal lining designed specifically for Bristol by Hainsworth. ECO-dry is an innovative garment lining available in two formats, ECO-dry Active and ECO-dry Cool. When used in combination with Crosstech Fireblocker moisture barrier, the flexibility of the XFlex system derives from the range of outer layers with which it can be married to achieve Level 2 performance rating. Included in the available options are Hainsworth Titan, Hainsworth Atlas (both incorporating Nomex fibres) and PBI Matrix.

For more information, go to www.bristoluniforms.co.uk

Batteries Boost Performance

LUKAS is heralding its eDRAULIC equipment as the first complete mobile rescue set to include cutter, spreader, combination tool and rescue ram offering mobility, space and weight benefits – a complete eDRAULIC rescue set is said to be up to 70 kg lighter than a hose-connected set – for rescue personnel. Versatility is given as being down to the gear's compact electro-hydraulic drive that can be powered by a power supply or by specially developed batteries where the maximum freedom of movement and handling is called for.

The performance of the high-end batteries used in the eDRAULIC series far exceeds what was available just a few years ago. On average, they reliably deliver 30 minutes of full power in a rescue operation; enough to free people from at least one vehicle. All of the batteries are identical in construction and can be swopped swiftly from one eDRAULIC rescue tool to another.

All of the tools work at an operating pressure of 700 bar, whether on power supply or battery power, matching the performance and speed of comparable hose-connected tools. As an example, the company cites its new eDRAULIC S 700 E cutter, the performance of which surpasses the earlier hose-connected top cutter in the LUKAS range, the S 510. The capacity of the built-in hydraulic pump can be adjusted for each individual tool, and the cutter opens and closes even more quickly.

For more information, go to www.lukas.com

New Firefighter Rescue Belt

MSA has introduced a new device for emergency egress. The Rescue Belt II System allows firefighters trapped in a building's upper level to rappel to safety.

The ergonomically-contoured Ara-Shield fabric rescue belt pouch easily stores the firefighter's rope, descender, hook or carabineer and is compatible with all MSA pouches, including ExtendAire II and Quick-Fill Systems. It meets NFPA 1983-2006 edition for Fire Service Life Safety Rope and System Components.

For more information, go to www.msanet.com

Australian PPE Partnership

ELLIOTT AUSTRALIA has been appointed as the exclusive distributor for Australia and New Zealand for Saint-Gobain Performance Plastics' Protective Systems group's line of ONESuit chemical protective suits.

ONESuit garments feature a single-skin design, engineered using Saint-Gobain's Coretech barrier membrane that is promoted as ensuring flexibility and enhanced user-comfort. The suits are certified to both EN and NFPA standards, ensuring international standards of protection.

For further information, go to www.elliottaustralia.com

Sprinkler System Standard Review

A review of the Standard for automatic fire sprinkler systems (NZS 4541:2007) has been started by STANDARDS NEW ZEALAND. It is anticipated that the draft Standard will be released for public comment by mid-2012, with publication of the final Standard in March 2013.

NZS 4541 provides rules for the design, installation, and maintenance of sprinkler systems so that these systems reliably achieve their two-fold fire control function. First, the fire must be controlled within a specified area and second, control should be achieved before levels of toxic or irrespirable products of combustion become life threatening.

The last revision to NZS 4541 was published in late 2007 and is referenced in the Fire Safety and Evacuation of Buildings Regulations 2006, and in Acceptable Solution C/AS1 Fire Safety and F7/AS1 Warning Systems of the Compliance Documents to the New Zealand Building Code. Standards New Zealand sought feedback from current users in June 2008 on suggestions for improvements to NZS 4541. This feedback was collated and sorted into two types: editorial and technical. The editorial corrections have been addressed through a project to produce Amendment 1 to NZS 4541:2007 that was published in June 2009.

For further information, go to www.standards.co.nz

Stay Sharp

According to WEBER HYDRAULIK, putting high strength cutting (HSC) inserts into the blade arrangement of the rescue cutter seems obvious really, but years of extensive research and investment and testing were necessary before the Austrian design team could launch its new Xtreme performance blades that are able to cut the newest composite materials.

Recent tests on the most up to date car posts, including the Mercedes CLK, have proved the ability of this tool. One recent test saw the RSX 200 Plus cutter make a number of successful cuts through the A-post of the new Audi A3 cabriolet. If blades ever need to be replaced only the inserts themselves need to be exchanged, resulting in significant cost savings. The composite make-up of these blades is so specialist that this, says Weber Rescue, could be the only rescue cutter to stay sharp during the entire life of the tool.

For more information, go to www.weber.de

New High-pressure SCBA

SCOTT SAFETY, a manufacture of personal and respiratory protective equipment, has announced that it is making further advances in fire service technology with the development of a new high pressure self contained breathing apparatus (SCBA). Working closely with cylinder manufacturer Luxfer, Scott Safety is currently developing 5500psi/379bar breathing apparatus sets. At 25 percent higher pressures than the current 300bar SCBA, the new sets are aimed at offering significantly increased duration with minimal increases in size and weight of the SCBA.

Among the claims being made for the new equipment is that it will provide fire fighters with lower profile sets and a decrease in wearer burden. Additionally, a cylinder the size of a typical 60-minute cylinder will now provide a duration of 75 minutes, providing the fire service with a convenient method of utilising an extended duration breathing apparatus.

Asia Pacific region customers had the first opportunity to see these new products on display at the recent Australasian Fire and Emergency Service Authorities Council Conference in Sydney.

For more information, go to www.scottsafety.com

New Remote Area Lighting

To provide users with a safer lighting option in hazardous locations, the Advanced Area Lighting Group of Pelican Products has rolled out the new 9435 Remote Area Lighting System (RALS) as its first safety-approved LED area lighting system.

It is said to be built with versatility and safety in mind. Among the claims made for it are that it is a compact system that boasts stringent approvals from ETL (Class I, Div 2) CE and ATEX. It features a swivelling telescope mast (extends to nearly 750mm), a 360 degree articulated light array and a wide-area handle for easy gloved grip and transport.

The 9435's LEDs and dual power mode – with waterproof switch – radiate 1,500 lumens in high and 750 lumens in low. Powered by a maintenance-free rechargeable battery, the system offers up to five hours of peak brightness and takes eight hours to be completely charged when fully expended.

For more information, go to www.pelican.com

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Public Sector Projects

APOLLO fire detection technology has been chosen to protect a number of public sector projects in Australia ranging from new-build developments to upgrades of existing systems.

These include an upgrade to the existing system at Brisbane Women's Correctional Centre and Wolston Correctional Centre, both located at Wacol in Queensland, Australia, that have been equipped with a new Apollo-based fire detection system.

Brisbane Women's Correctional Centre has up to 258 prisoners across two accommodation areas – secure and residential cells – and includes a purpose built-area that can accommodate women who have been approved to have their children live with them in custody. Adjacent is Wolston Correctional Centre, which houses 600 male inmates.

Apollo's XP95 system was chosen to meet the main fire detection requirements at the site. The installation comprises 3,500 devices including more than 1,500 smoke detectors, 1,200 heat detectors and 500 interface units. The system is based around 46 networked Ampac control panels, integrated into the prison's building management system.

Apollo was also selected to protect Australia's Blacktown 200-man army camp at Robertson Barracks near Darwin, Australia. The barracks includes 100 accommodation blocks. The 5000 square metre camp project utilised Ampac's FireFinder ten- loop panel, incorporating 270 Apollo XP95 smoke and heat detectors and 220 integrated sounders.

The fire system is configured into zones made up of eight or 16 rooms. Each room was fitted with an Alarm Acknowledgement Module (AAF). In the event of a non-fire alert, the occupant has 30 seconds to press the AAF, providing a further 90 seconds to clear the source of alarm. If the source clears within this period the alarm will reset. If it is not cleared, the alarm will continue and the building is evacuated.

For more information, go to www.apollo-fire.co.uk

Packed, and Ready to Go

The problem of overlooked or misplaced rescue tools such as seatbelt cutters and hook and fork tools has been addressed by HOLMATRO with its new Rescue Support Bag containing the most frequently used tools vehicle extrication assist tools.

The lightweight tool bag is designed to allow easy movement during the rescue operation, and is made of tough, fire-retardant material. It comes with adjustable waist and thigh straps that are easy to secure by means of a three-point click buckle. The Rescue Support Bag can also be Velcro-attached to a rescuer's belt.

It contains a tyre deflator, seatbelt cutter, window punch, flexible steel rule, marker pen, mini LED torch, multi-cutter and hook and fork tools.

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Fire Australia 2011

The Fire Australia 2011 Conference and Exhibition, to be held at the Adelaide Convention Centre from 16th to 18th November, is set to be the largest in the event's history. It is the premier fire protection industry conference and exhibition in Australia, attracting key personnel, peers and significant representation from businesses, government and associations.

The Fire Australia 2011 conference will fully explore current issues relevant to the event's theme – The Essentials of the Future: Education and Maintenance.

Each year sees both repeat delegates and new industry members congregate, network and socialise at the conference, providing an excellent opportunity to meet clients and colleagues face to face. The conference is organised jointly by the Fire Protection Association Australia (FPA Australia) and the Institute of Fire Engineers Australia (IFE).

"The Fire Australia Conference and Exhibition is one of the showcase events on the fire protection calendar and continues to grow in size each year," Scott Williams, FPA Australia Chief Executive Officer, says. "This year's conference theme of education and maintenance is particularly important and the scale of the program is reflective of this." He continues: "Education and maintenance is considered essential for the future development and stability of the industry, and issues surrounding this, including potential problems and the scope of practices moving forward will be discussed in depth at Fire Australia 2011. We are expecting our largest number of exhibitors and we have added further innovations to the program that has it shaping as our most successful yet."

The program will include both local and international keynote speakers and will primarily address the education and maintenance theme, some of which include:

- Can training and education keep up with changing technology, practices and Standards?
- How trained and educated technicians can save time and money for clients.
- Who trains the trainers – is the cycle robust?
- Educating my workforce – cost versus benefits.
- Formal training versus experience – the age old dispute.
- Proactive verses reactive maintenance and upgrades.
- Compliance maintenance versus equipment performance.
- Maintenance of alternative solutions – what are the protocols?
- Maintenance shortcuts – are efforts to save costs compromising safety?
- Working with poorly documented installations and maintenance.
- Dealing with disrepair – what is the responsibility of the service company?
- Is there a need for nationalising maintenance requirements?
- Civil, criminal and duty-of-care responsibility – are you aware; are you covered?
- Enforcing compliance – who do we look to?

16th to 18th November

In addition to this, various other key issues will be included and discussed to ensure delegates receive comprehensive industry knowledge.

Last year's conference, at the Gold Coast Conference and Exhibition Centre, attracted almost 400 delegates and 50 exhibitors. The theme surrounded Communities and Infrastructure: Protecting our Assets, which focused on society's assets, heritage and resources, while previous themes have included Fire Protection: The Great Debate, which saw a new approach to the presentation format.

Fire Australia 2011 will see speakers from across Australia and overseas converge in the South Australia capital. Organisers have aimed to ensure all presentations are contemporary and current, providing all delegates with additional knowledge and information. With a single stream of presentations, all delegates will be present for every speaker. A new addition to the program in 2011 will be the inclusion of breakout workshops, permitting attendees to discuss and provide feedback on topical issues.

"We wanted to build on some of the advances we made at last year's conference, and the breakout workshops will provide delegates an extra level of engagement," Williams says.

The conference location, the Adelaide Convention Centre, will house all aspects of the conference, idyllically located between the city's CBD and the banks of the River Torrens. This Centre ranks as one of Australia's best convention venues, offering environmentally friendly energy, lighting and materials. The dates of the event are well suited to provide delegates the opportunity to stay for the weekend in Adelaide or the surrounding area.

The program will incorporate two-and-half days of presentations, workshops and social activities, including a cocktail reception, conference dinner hosted by renowned Australian entertainer Shane Bourne, and a farewell lunch, ensuring plenty of networking opportunities. There is also a partner's program that provides three days of activities exploring Adelaide and the surrounding areas.

Sponsorship and exhibition opportunities are currently available. 2011 will see the largest exhibition Fire Australia has ever seen, with over 60 booths available, a meet the speaker lounge, internet kiosks and café style catering. There are plenty of high-exposure locations but those wanting multiple booths are advised to book early to avoid disappointment. Currently more than half the exhibition has been sold to a wide array of organisations across many different sectors of the industry. Providing attending delegates an excellent opportunity to remain abreast of current products and services.

"This year also sees a wider range of sponsorship options for organisations to affiliate themselves with the conference and receive varying levels of exposure," Williams points out. "Primarily there are now three levels of major sponsors; Silver, Gold and Platinum, plus the addition of lunches, tea breaks, lanyards and the internet kiosks." He concludes: "We believe there is now a sponsorship opportunity to suit everyone's budget and marketing objectives."

To date sponsorship has been received from several key industry companies, including Boss Fire & Safety, Coopers Fire, Alan Wilson Insurance Brokers, Chubb Fire & Security, Pertronic Industries, Fire Protection Technologies and Ampac Technologies.

Both FPA Australia and IFE Australia assist in the sourcing of key speakers and promotion of the conference and exhibition, which attracts thirty plus presentations, forty plus exhibiting organisations, several hundred delegates and an array of sponsors.

Registrations for the conference are now available, with early-bird discounts available until Friday 14th October 2011. Each delegate registration includes full access to all sessions, admittance to the welcome cocktail reception, conference dinner and farewell lunch, plus a delegate's satchel including copies of all the presentations. For updated information, sponsorship and exhibition availability and to download the various brochures (Exhibition and Sponsorship and Delegate Registration), visit the conference website. APF

For more information go to
www.fireaustralia.com.au

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FPA AUSTRALIA

Aircraft Hangers – Safe and Sound Protection

Bob Grieve

Delta Fire Australasia

Hangers are getting larger, as are the aircraft they are designed and built to accommodate. Both the hanger structures and the aircraft are also becoming increasingly expensive to build, which is raising the stakes when it comes to hanger fire protection.

The Asia Pacific region is home to five of the world's busiest 20 airports; together, airports in Beijing, Hong Kong, Singapore, Sydney and Tokyo had just short of 270 million passenger movements in 2010. A number of airlines based in the region also operate the world's latest generation of "superjumbo" aircraft, including the largest passenger airliner in the world, the double-deck, wide-body, four-engine Airbus A380, which is operated in the region by Korean Air, Singapore Airlines and Quantas.

Many airports have had to modify and improve their facilities to accommodate aircraft of this gigantic size. The 525-seater Airbus A380 for example has a wing span of 79.75 metres, an overall length of 72.72 metres and a height of 24.09 metres. Compare this with the original giant of the skies, the Boeing 747-100B that has a wingspan a full 20 metres shorter. The result is that hangers have had to be built to house these giants at a growing number of international airports around the world. The largest is believed to be the Dubai Airwing Hangar at Dubai International Airport in the United Arab Emirates, which has eight sets of doors that are 26 metres high and span 570 metres – the length of almost six football pitches.

That being said, hangers vary greatly in size, construction and use, and these factors are important considerations when determining the fire protection requirements of the building and its contents. It is important to determine the type and number of aircraft that the hangar will accommodate, the mix of aircraft that are likely to be housed in the hangar at any one time, and how this might change as the airport develops and new aircraft come on stream.

It is particularly important to determine the type and scale of maintenance that will be performed on the aircraft in the hangar as this can vary from virtually no maintenance in hangers designed to solely protect aircraft from the elements, to complete overhaul of the aircraft. It is also worthwhile to bear in mind the timescale in which this maintenance takes place. From the airline's point of view it is essential that maintenance time is minimised to maximise the opportunity for the aircraft to fly with paying passengers or freight.

The Hanger Fire Risk

Due entirely to the nature of the contents of aircraft hangers they present very special and unique high-hazard fire protection challenges that require the maximum hazard mitigation. Aircraft such as the Airbus A380 cost in the region of US$ 375 million and have expensive electronics and large highly combustible fuel loads that demand fast and reliable suppression. Indeed, in the majority of cases, the aircraft are more valuable than the hangars in which they are accommodated.

It is though important to understand that the majority of hangers (other than those used solely for garaging aircraft) are sub-divided into a number of areas that may include some or all of the following:

- The hangar or aircraft storage area.
- Maintenance workshops.
- Warehouse and storage areas.
- Administration and supervision offices.
- Electrical and hydraulics utilities areas.

The generally held view is that the highest risk of a fire in a hangar occurs when an aircraft is undergoing either repair or maintenance, and when fuel is being stored or handled. While there are strict international protocols regarding fuel in an aircraft, it is impractical to remove all fuel before to moving it to a hangar, so the presence of flammable aviation fuel is a constant danger.

While hanger fires are, thankfully, rare they do nevertheless occur. In 2007 a fire in a maintenance hangar in Abu Dhabi completely destroyed a Qatar Airbus A300-600 aircraft. Two other aircraft were damaged, one being an Air Mauritius A319 that had been parked in the hangar next to the Qatar A300. A year earlier a fire at a Sabena Technics hangar at Brussels' national airport destroyed four aircraft including a Belgian armed forces Lockheed Martin C-130H Hercules and an Airbus A320. Temperatures in the hanger reached at least 100°C, buckling the all-metal structure and bringing down the roof.

Hanger Protection Foam

Foam has proven to be the most effective firefighting agent for hanger fires, and three key considerations need to be taken into account when devising the most effective and reliable solution. These are: the foam concentrate itself; the foam delivery system; and the siting of the delivery hardware.

Foam technology has developed apace in recent years and foam concentrates suitable for hanger protection are available from several companies, most notably the Swedish manufacturer, Skum, the Italian company, SaboFoam, Ansul and the Scandinavian supplier, Solberg, which was recently acquired by the USA-based Amerex Corporation. Well known and respected brand names include Towalex, Hydrex, and Ansulite.

Synthetic AFFF (Aqueous Film Forming Foam) concentrates have now been successfully installed in both civil and military aircraft hangars. These are water-based and have the ability to spread over the surface of hydrocarbon-based liquids. Alcohol-resistant aqueous film forming foams (AR-AFFF) are resistant to the action of alcohols and are able to form a protective film.

For these "enclosed" hanger applications, high-expansion foam is the ideal choice, owing to its use of the minimum amount of water. A characteristic of a high-expansion system is that the total amount of water required to extinguish a fire is, in relative terms, small, and so the total quantity of extinguishing media to be cleaned up after the fire has been extinguished is also minimised. The foam will, within minutes of its release, completely fill and engulf the area in which the fire has occurred, and so extinguish the blaze.

High-expansion foam can be put into two very broad categories: Class A foams and Class B foams. This is an important distinction, as a Class A foam is not designed to put out Class B fires. Class A foam is suitable for freely burning materials

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such as wood, paper, textiles and other carbonaceous materials and, while it might extinguish a Class B flammable liquids fire, its use might lead to catastrophic results because of its inability to secure the liquid's explosive vapours. Class B fuels can be subdivided into two more subclasses: non-polar solvents such as aviation fuel that will not mix with water, and polar solvents that will mix with water.

In such applications as aircraft hangers, high-expansion foam has what is often called a "mass effect", isolating the entire fire area and extinguishing a fire in several ways. The water within the foam is turned into steam and contributes towards a rapid cooling of the fire; the steam also acts as an inerting agent and reduces the oxygen content of the air; the isolating characteristic of high-expansion foam prevents heat from spreading and setting other objects alight; and the foam also prevents flammable gases from spreading and igniting.

Foam Delivery

The majority of aircraft hangers are best protected using fixed foam firefighting monitors of either the oscillating type or fixed-nozzle type.

In brief, oscillating monitors, as the term implies, automatically oscillate from side to side when discharging foam onto the hangar floor. They are normally preset to swing back and forth over a given arc – typically at set sweeps of 30 degrees, 50 degrees, 70 degrees and 100 degrees – to provide a flow rate over a particular area, delivering a uniform foam blanket across the aircraft's fuselage, wings and the hangar floor area in the first sweep.

Fixed-nozzle monitors have nozzles that are, typically, mounted on a manifold or as single units approximately one-metre above the hangar floor. They have a preset angle of elevation and discharge pattern calculated to deliver the most effective stream pattern and range while ensuring that the stream is kept low enough to flow under the wings of any aircraft. This type of monitor system is frequently installed in hangers where aircraft or maintenance equipment in the hangar could interfere in the normal operation of the oscillating type monitor.

In essence, both of these types of monitors stand guard over a specific fire risk, hence the importance of ascertaining what type and size of aircraft are to be accommodated, where they will be positioned, and where maintenance fire risks are most likely to be located.

Monitors need to be robust, unerringly reliable and deliver their promised performance at a moment's notice. There are numerous manufactures of fire monitors with Skum and the Korean manufacturer, Shilla Fire, being among the most popular throughout the Asia Pacific region. Depending on the specification of the particular model, flow rates are available between 10,000 litres-a-minute and 20,000 litres-a-minute with maximum "throws" of more than 120 metres. Each system has its particular benefits and, in addition to the facility to preset the monitor's discharge, the leading equipment manufacturers' monitors incorporate either or both manual and remotely-controlled override. This enables the stream of foam to be re-directed with a manual rotation of 360 degrees and vertical elevation between minus 60 degrees and plus 90 degrees to enable it to be focused on a particular hot-spot.

Positioning Matters

Positioning of the fire monitors is absolutely critical and is something that may need to be under constant review. This need for persistent re-assessment is possibly less so in the case of purpose-built hangers for aircraft such as the Airbus A380, where there is unlikely to be a significant change to the position of the aircraft in the hanger or the location of particular fire risks.

However, if the hanger is used for a variety of different types and sizes of aircraft and if it is used for both fixed-wing aircraft and helicopters, maintenance work may be carried out in any number of different areas of the hanger, and the location of potential fuel leeks may vary greatly from one aircraft to another. There may also be a wide variation in fuselage and wing height with which to contend. Structural alterations to the hanger also have the potential to jeopardise the effectiveness of the firefighting if, for example, workshop or storage areas are enlarged or relocated.

So, all in all, hanger fire protection is not a simple matter, and the stakes are very high. It is certainly not a time to cut corners or take chances. As the fire in Abu Dhabi showed, if a fire is not tackled quickly and decisively, disaster is the inevitable outcome. APF

Bob Greive is Managing Director of Delta Fire Australasia Pty Ltd

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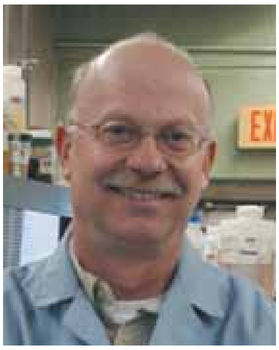
The Fluorinated versus Non-fluorinated Foam Debate



Mitch Hubert

Dynax Corporation

Over the past several years a debate has raged over the use of fluorinated versus non-fluorinated foam. Much of the debate has centered on the environmental acceptability of fluorine- foams and their long-term viability in the market.

During this time, much confusion and misinformation was spread about the type of fluorine that is being used, and the environmental fate of the fluorine that is being used. At present, the C6 fluorotelomers that are being used have gone through a whole host of testing to determine the ultimate fate and risk in the environment. This data has been presented at a number of conferences and in a number of scientific journals, and by now should be sufficient to allow environmental and toxicological professionals to come to independent conclusions relative to the acceptability or non-acceptability of the risk associated with the use of fluorine-containing foams. Certainly, the risk profile for fluorine-containing foam appears to be quite acceptable by most measures being employed today.

Also missing in the debate is one of the properties that makes fluorine-containing foams so effective. One often sees articles and hears about the film forming capability of fluorine- containing foams such as AFFF and FFFP and how the ability to form a film makes this type of foam so effective. And, indeed, this is a major advantage that fluorine-containing foams exhibit. What is missing however is the second important property that the use of fluorochemicals brings to firefighting foam. That property is the ability to shed fuel as the foam is applied to the surface of a burning hydrocarbon fire. This ability to shed fuel or resist fuel contamination of the foam blanket is called oleophobicity (Quite literally "oil fearing or oil hating").

Perhaps the best way to describe oleophobicity is to look at what would happen if we were to place a single bubble of a fluorine-containing foam versus a single bubble of fluorine-free foam on the surface of a hydrocarbon fuel such as kerosene or petrol.

The fluorine-containing foam bubble will try to repel any of the hydrocarbon fuel because of its oleophobic nature. The fluorine-free foam on the other hand uses detergent-type surfactants that actually attract the hydrocarbon fuel. They are called oleophillic (Quite literally "oil loving"). A single bubble of a detergent-based foam will act much like the wick on a kerosene lamp. Before long it will actually be flammable as the hydrocarbon fuel wicks up along its surface. In fact, the reason that detergents are used in cleaning applications in the first place is their ability to emulsify grease and oils and free them from the surface of whatever is being cleaned; be it your automobile, your clothes or your dinner dishes.

So, how do fluorine-free foams work to

What is lacking in the debate is the relative effectiveness of fluorine-containing foams versus fluorine-free foams, and what must be taken into account when choosing to use one over the other.

What seems to be lacking in the debate so far is the relative effectiveness of fluorine-containing foams versus fluorine-free foams and what must be taken into account when choosing to use one over the other.

Fluorine-containing foams have a long history of successful extinguishments of major fires throughout the world. As such, it is relatively easy for a trained professional to make an informed decision regarding the use of fluorine-containing foams. The decision is not so easy for fluorine-free foams. Most of the data that supports the use of fluorine-free foams has been based on performance fire testing using small scale fires. The problem with using only this type of information to decide on which type of foam to use is that the fire tests are carried out under controlled conditions and using foam qualities that are difficult to obtain with conventional air aspirating foam hardware such as branch pipes or foam pourers.

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control or extinguish a fire? Quite simply, they rely on a very stable foam blanket to be placed on the surface of the burning fuel. At the immediate interface between the foam blanket and the surface of fuel there is a layer of contaminated foam bubbles that will readily burn. However, a good fluorine-free foam will have a layer of uncontaminated and very slow draining foam to cap over the contaminated foam and so prevent that contaminated layer from burning. This is essentially the same way in which regular protein foam has worked for years.

First and foremost, the firefighter will be required to get closer to the fire. Obviously, the further away a firefighter can get from the blaze the better off he or she will be. In contrast when using a fluorine-containing foam, not having to use an air aspirating branch pipe or nozzle will allow the firefighter to use a conventional variable pattern water nozzle.

The key here is to produce a very good quality foam and to apply it as gently as possible so as to minimise the amount of contaminated foam. This makes fluorine-free foams very effective on small to medium sized fires and especially spill type fires rather than fuel in depth fires. The firefighter, since he needs good quality foam, must use air aspirating branch pipes or nozzles or other discharge devices.

The use of air aspirating discharge devices of course means that the range of that device is limited by its flow rate and operating pressure. This is in contrast to a fluorine-containing foam that may be applied through non-air aspirating discharge devices. In fact, much of the foam application for fluorine-containing foam is through non-aspirated variable pattern water nozzles. The use of this type of nozzle provides maximum range as all the energy of the system goes into range rather than stealing some of the energy to aspirate the foam. It is a general rule of thumb that, with air aspirated discharge devices, as the foam quality goes up the range of the device goes down.

The fact that fluorine-free foam requires good foam quality and so requires an air aspirated discharge device brings with it some logistical fire ground considerations that must be evaluated.

First and foremost, the firefighter will be required to get closer to the fire. Obviously, the further away a firefighter can get from the blaze the better off he or she will be. In contrast, when using a fluorine-containing foam, not having to use an air aspirating branch pipe or nozzle will allow the firefighter to use a conventional variable pattern water nozzle. The use of this type of nozzle brings with it the ability to go to a fog pattern. If there is a thermal event, a firefighter using fluorine-containing foam can always go quickly to a fog pattern and back away from the fire. This would not be possible for a firefighter using an air aspirated branch pipe or nozzle.

Fluorine-free foams must be applied as gently as possible in order to avoid contamination of the foam blanket. As the flow rate of the discharge device increases so does the impact velocity of the discharge stream. When one gets up into high flow discharge devices, the impact velocity of the stream onto the fuel surface can get extremely high. For spill fires this is not too big an issue but for fuel in depth fires, such as might be encountered in a fuel storage tank or a bunded area, the submergence of the foam stream beneath the fuel surface can result in a large amount of foam that becomes contaminated with the fuel.

Remember, fluorine-free foams are not oleophobic. This can make extinguishment very difficult if not impossible under these conditions. Certainly the time that foam would have to be applied would be expected to increase significantly under these conditions. This means more foam concentrate would have to be positioned and used at the fire and the water supply must be sufficient to account for longer discharge times. Application rates may also need to be higher with fluorine-free foam as compared to fluorine-containing foam but this would have to be determined as part of a large fire pre-plan.

> **Fluorine-containing foams are available for proportioning at 1 percent and have been successfully used at this proportioning ratio on large fires. Fluorine-free foam is not available as a 1 percent concentrate; it is available as a 3 percent concentrate.**

Another logistical issue associated with using fluorine-free foam on large fuel in-depth fires would be the amount of concentrate that would be required on the fire field. The fact that application rates may need to be higher and discharge times may need to be longer were already discussed above. These mean both larger quantities of foam concentrate would need to be brought to the fire and must be staged near the proportioning equipment. The other consideration for supplying foam concentrate to the fire scene is the mix ratio or proportioning ratio of the foam concentrate.

Fluorine-containing foams are available for proportioning at 1 percent and have been successfully used at this proportioning ratio on large fires. Fluorine-free foam is not available as a 1 percent concentrate; it is available as a 3 percent concentrate. However, this fact alone means that at least three times as much concentrate will have to be moved to the fire scene and staged near the proportioning equipment and in reality, probably more to account for higher application rates and extended discharge times.

In the final analysis, either fluorine-containing or fluorine-free foam can be used successfully on flammable liquid fires. The firefighter must, however, be aware of the logistical and safety issues that come with the use of fluorine-free foam.

For small to medium size spill fires either type of foam concentrate can be deployed successfully with about the same outcome. But, as the fire size increases and the depth of the fuel increases, more attention must be paid to overcoming the logistical and safety issues surrounding the use of fluorine-free foam on this type of fire. And, as with all firefighting, success or failure depends on the knowledge, skill and training of the firefighter. APF

Mitch Hubert is Vice President of Marketing at Dynax Corporation

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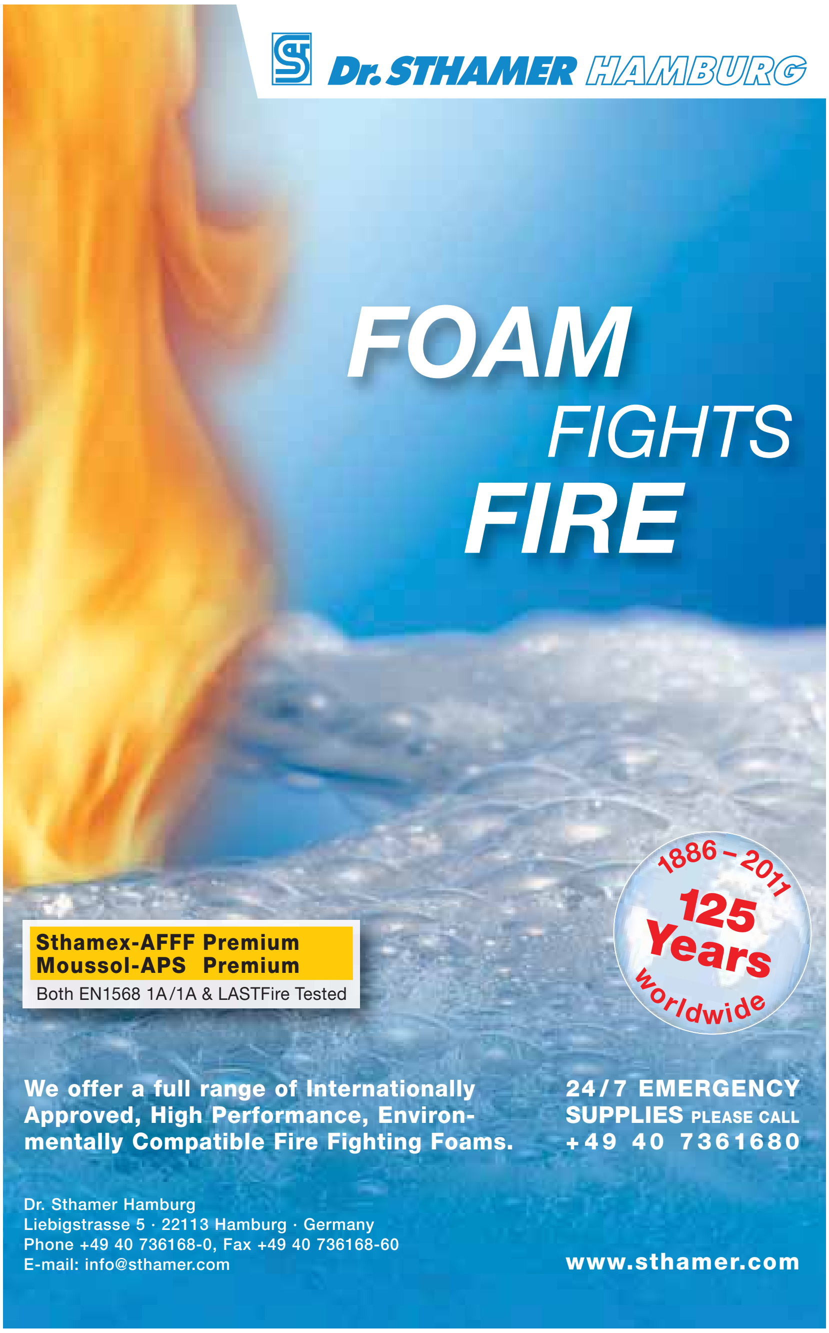

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DX1080	Nonionic	●	●	●	●
DX1090	Nonionic	●	●	●	●
DX1025*	Anionic	●	●	–	–
DX1026*	Anionic	●	●	●	●
Foam Stabilizers					
DX5022	Anionic	–	●	–	●
DX5065**	Anionic	–	●	–	–
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Burn marks on the back wall after the first test that indicate fire spread towards the back corner of the unit

New Sprinkler Concept Developed for IKEA

Magnus Arvidson

SP Technical Research Institute

Recently conducted sprinkler tests inside a VASS (Vertical Automated Storage System) unit for IKEA aimed to determine whether sprinklers installed at the top of the unit are able to protect it during a fire and limit the risk for fire spread.

A VASS unit is an enclosed system of vertically arranged trays, an extraction platform and a series of computerised controls that delivers items to an ergonomically positioned workstation. The unit automatically locates and retrieves stored items with the push of a button or scan of a bar code. The trays handled by the system can be equipped with partitions and dividers, totes and containers, cases and cartons. The benefits of this storage concept include maximum use of available space, increase productivity and improved worker safety.

Storage inside a unit is very compact. Technology is used to scan every tray's height and the trays are automatically stored in the optimal space in the unit. A built-in weight scale automatically checks a tray's weight to protect against overloading of shelves.

The primary sources for ignition inside a VASS unit are related to computer control and the electrical motors associated with the extraction platform, so a built in fire protection system is often required.

IKEA's VASS Unit

The VASS units used by IKEA are designed to fit its specific needs regarding the dimensions of the trays and the overall capacity. The trays are constructed of steel, with solid side plates. The individual trays measure four metres by 800mm, and the rim height is 250mm. In the tests, two dividers were installed such that three compartments were formed for each tray. The unit used in the fire tests had at total of 45 trays, 25 trays on the back wall and 20 trays on the front wall.

In practice, the most common commodities stored in VASS units at IKEA are products such as kitchen articles, doors, drawers and textiles. Products from unexpanded plastics are not as common and products from expanded plastics are prohibited.

The unit used for the tests measured approximately eight metres high, 4.4 metres long and three metres deep.

Test Objectives

Prior to the tests, it was concluded that the use of solid trays with solid side plates would prevent

The VASS unit inside the fire test hall

water from sprinklers at the ceiling to reach the seat the fire. Therefore, fire suppression by the activation of sprinklers installed at the top of the unit was not expected. Additionally, the trays are fitted with holes in the ends of each tray that would drain water to the sides. This feature is designed to prevent the top trays from being filled with water, jeopardizing the stability of the unit.

It was also understood that the enclosed construction of the VASS unit and the solid design of the trays would in itself delay the spread and intensity of a fire. The steel trays restrict the possibilities for vertical fire spread and the compact storage restricts air movement, which limits the oxygen concentration at the seat of the fire. When filled with combustion gases, the oxygen concentration inside the unit as a whole is reduced, which would reduce and possibly even quench a growing fire.

Hence, it was recognised that the limitation of the fire size would be due to a reduction of the oxygen concentration by the fire itself and to some extent by the formation of water vapour. In order to facilitate the desired reduction of oxygen, it was therefore deemed essential that the structural integrity of the VASS unit remains intact during a fire. As a result, the following criteria were set up as minimum requirements to judge the test results as acceptable:

1. The VASS unit must remain structurally intact.
2. No full or partial rupture of any of the wall or ceiling panels or joints between these panels is allowed.
3. No rupture of the hatch for the front opening is allowed.
4. No fire spread to adjacent objects or combustible material is allowed.

The Sprinkler System

The sprinkler system was intentionally designed to be relatively simple. The system pipe-work was laid out on the ceiling with drop nipples to the individual sprinklers. Four pendent, standard coverage, quick-response sprinklers were installed to ensure wetting of the inside surface of the walls of the unit. An optical photoelectrical smoke detector was installed at the ceiling of the unit, and the response time of the detector was recorded in order to provide a comparison with the activation time of the sprinklers.

Instrumentation and Measurements

Thermocouples were installed inside the unit to document the potential fire spread. Additionally, the surface temperatures on the outside of the unit were measured using thermocouples that were spot-welded directly to the outer steel panels. A thermal imaging camera was positioned behind the back wall to document the thermal exposure in the area where the fire was initiated. The concentration of Oxygen (O_2) was measured at the centreline of the unit and 1.3 metres and 3.2 metres respectively, above floor level. The lowest position (1.3 metres) was at the level of the tray where the fire was initiated.

IKEA Commodity

The EUR Std Plastic commodity was used in the tray where fire was started and in the trays directly above. This commodity is similar to the FM Global Standard Group A plastic commodity, which has been widely used in the fire protection community to create a representative "benchmark" warehouse fire hazard for the evaluation of sprinkler fire protection performance in large-scale fire tests since the 1970s.

Authentic IKEA commodities (pillows of synthetic material and plastic crates) were used below and above these trays. All other trays were filled with packages of particle board or packages with kitchen doors from IKEA's product line. This commodity represented a realistic load and acted as an indicator of fire spread.

Tests

Two tests were conducted. In both, the fire was initiated in one of the bottom trays at the back wall of the unit. For the first test, the unit was loaded as would be expected under normal conditions, meaning that the density of the loading of the trays was high. The fire growth rate during the test was extraordinarily slow, due to the solid design of the steel trays that restricted the possibility for vertical fire spread. It is also clear that the compact storage (the minimum free vertical distance between individual trays was 25mm) restricts air movement and limits the oxygen concentration at the seat of the fire.

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The plastic commodity used in the tray where the fire was initiated

The fire detector at the ceiling responded at 07:15 [minutes/seconds] but the first, and only, sprinkler did not activate until after more than an hour. The oxygen concentration inside the unit at the activation of the sprinkler was approximately 13.5 vol-%. The oxygen concentration increased after the activation, probably due to mixing effects and a pressure reduction due to cooling by the water droplets, which drew fresh air into the unit. As the fire continued to burn, the oxygen concentration was further reduced and did not increase until manual firefighting was undertaken, 30 minutes after activation of the sprinkler.

The surface temperature at the wall panel closest to the fire was approximately 200°C at the activation of the sprinkler, however, the application of water did not immediately reduce the surface temperature at this position. Rather, the temperature continued to increase and peaked at 405°C. The closest thermocouple, 1.1 metres above this point, was reduced from approximately 110°C to approximately 80°C by the application of water, which indicates that the high temperature exposure was very local.

For the second test, the tray directly above that where the fire was started, was removed. The free vertical distance between the fire tray and the tray above was therefore increased from 25mm to 300mm. As a result, the fire growth rate was significantly higher than that in the first test. This translated to a more rapid reduction of the oxygen concentration inside the unit.

The fire detector at the ceiling responded at 02:49 [minutes/seconds] and the first, and only, sprinkler activated at 08:53 [minutes/seconds] after ignition, at an oxygen concentration of approximately 14.5 vol-%. The oxygen concentration continued to fall, as the fire was not extinguished by the application of water, and reached a minimum level around 11.0 vol-% at approximately 14:00 [minutes/seconds]. This oxygen level was low enough to quench the fire.

Manual firefighting was not necessary. The surface temperature at the wall panel closest to the fire reached 600°C. The application of water did not immediately reduce the surface temperature at this position. The closest thermocouple, 1.1 metres above this point, peaked at 57°C, which indicates that the high temperature exposure was very local. These figures show that the fire spread in both directions on the tray from the fire source and heated up the whole length of the wall panel.

Conclusions

As expected, fire extinguishment from an installed sprinkler system may not be guaranteed in practice due to the shielded nature of the fire. However, automatic sprinklers installed at the ceiling of a VASS unit will maintain the structural integrity of the unit during a fire and the temperature exposure to the wall panels will remain local. It was also verified that the probability of fire spread to adjacent combustible objects or material outside of the unit is very small, as only small parts of the wall were heated up.

As fire extinguishment is not guaranteed, it is advisable that a strategy, equipment and instructions for manual firefighting are developed. The following strategy is suggested:

1. The VASS unit should not be opened during a fire, use water from fire hoses to cool the structure from the outside.
2. Use an infrared (IR) thermal imaging camera to help locate the fire.
3. Drill small holes and insert lances at the seat of the fire; use water to fight the fire locally.
4. Allow time for cooling before the unit is opened and ventilated.

A final word of caution is necessary. The experience described in this article is not directly applicable to other types of compact storage units. The geometry, construction and design of the units used by IKEA are unique and intended for their commodity and purposes. Other type of compact storage units that do not have the features of IKEA's units may require other types of fire protection systems or other sprinkler system designs in order to meet the desired fire protection objectives. APF

Magnus Arvidson is a fire protection engineer at SP Technical Research Institute in Sweden

For further information, go to www.sp.se

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Equipment Developments in USAR

Ian Dunbar

Holmatro

The physical and emotional burden on USAR personnel deployed anywhere in the world is enormous. For this reason alone, the equipment they choose must perform in the toughest of environments.

So far the 21st century has witnessed global devastation on a scale not seen in living memory. Indeed the century was not even a month old, when there was massive destruction due to the Gujarat earthquake in India and then of course, came 9/11. On Boxing Day 2004, a 9.1 magnitude earthquake off the west coast of Sumatra, Indonesia led to a tsunami, which affected 14 countries. In October 2005, the Kashmir region of India was hit by a quake. Haiti was devastated by an earthquake that hit the island in January 2010 and in 2011 we have also seen New Zealand and Japan hit. Approximately one hour after the Japan earthquake, a tsunami hit the island (and affected the wider Pacific region).

This series of high profile natural disasters, and other man made events, are a stark reminder, if it were needed, that urban search and rescue (USAR) personnel need to be better prepared than ever before and have the latest equipment to allow them to perform with maximum safety and success, in these areas of devastation. It also serves to remind us that USAR is no longer just confined to rescue from collapsed structures. Due to the types of disasters we have seen, USAR teams also have to be proficient in, and have the tools for rescue from all types of vehicles and public transport. Following a tsunami, they have to be prepared for the rescue of persons who could be found in any location.

Rescue Tools

All USAR operations require specialist tools. Manufacturers of hydraulic rescue equipment have worked closely with rescuers to ensure that the advances in recent years allow teams to operate more safely and more effectively. The ability for teams to work with well-designed, ergonomic and intelligent equipment means that casualties stand a better chance of being located sooner, medically stabilised and extricated more quickly, which greatly increases the chances of survival.

Ian Dunbar is the Rescue Consultant at Holmatro

For further information, go to www.holmatro.com

There have been many advances in all types of rescue equipment designed for USAR operations. These changes have come in the form of specifically designed cutters, for the cutting of chain, padlocks and rebar (reinforced steel found in masonry and concrete as a tensioning device). These are small and can be operated by one hand and powered by small, mobile pumps, light enough to be taken over challenging terrain.

Tools that are designed specifically for crushing concrete give crews an alternative to the practice of sawing. This type of tool is silent in operation and creates far less dust during operations, which improves the environment for rescue personnel and casualties alike. Hand-controlled hydraulic cutters and "combi" tools (combination of spreading and cutting) are silent in operation, making the scene safer due to improved communication. Less noise also means the increased ability to locate casualties, maintain contact and perform remote medical assessments far more effectively.

Rescuers now have more options when it comes to lifting. Hydraulic wedges allow lifting operations to commence in narrow openings (from an initial height of 6mm). These wedges can be hand controlled or powered by a pump. The initial use of the hydraulic wedge can be followed up by high pressure airbags, toe jacks and hydraulic cylinders.

The success of change under flow type couplings for specialist cutters and wedges mean that the rescuer can have hoses extended to the scene of operations and change tools independently. This increases the capability of the rescuer in terms of using existing hydraulic tools for USAR operations.

Self-contained tools, whether hand or battery operated, are invaluable for use in urban search and rescue. Not only are they versatile enough to deal with a wide variety of materials, they are also light and easily portable. Hand operated tools are ideal for work in confined spaces, producing no noise or emissions. Battery operated tools, with their small dimensions, are ideal for use on smaller police, fire, ambulance and rescue vehicles. They are also ideal for use on rescue helicopters where weight limits are very important.

Challenging Environments

It must be remembered that the geographical locations where USAR teams have to work vary greatly, making logistics difficult at best and nearly impossible at worst. The New Zealand earthquake for instance saw teams located in Christchurch, a large modern city with well-developed infrastructure (albeit affected by the earthquake). Rescuers in Japan however faced a very different situation in terms of gaining access for personnel and equipment. The nature of the Japanese tsunami meant that the infrastructure that did exist, was simply washed away making the availability of light, self-contained tools, a logistical advantage.

Buildings vary greatly all across the world. Their design, the materials used and the methods of construction employed, all mean that there can be no standard approach to urban search and rescue. It therefore follows that next to specialist equipment, USAR teams also need rescue tools versatile enough to deal with the many types of materials that will be encountered. It should also be remembered that rescue from a collapsed structure means not only penetrating the building materials, but also the contents of the structure, whether that is furniture, fittings, fabrics or indeed vehicles.

Advances in casualty detection (seismic/acoustic listening devices, canines) mean that casualties are being located at greater depths than ever before, both horizontally or vertically. This presents problems in terms of maintaining safe access and egress due to the need to stabilize debris. Because of this, emergency shoring is now becoming more complex and intelligent systems are invaluable. They must be light, readily deployable and provide structural support in a whole host of situations where various heights and spans are required. They must also have options in terms of method of operation being manual, pneumatic or hydraulic. A great advantage is for your shoring system to have a capacity to lift.

Conclusion

The work of urban search and rescue specialists is difficult enough, but we must also remember that all of the devastation we have witnessed throughout the first decade of the 21st century has coincided with the rapid growth of instant media. Twenty-four hour rolling news and smart phones mean that disasters are now reported on virtually as they happen and witnessed on a global scale, adding to the pressure and increasing the expectancy on rescuers.

The challenge for USAR teams is to constantly maintain and increase skills and knowledge, while all the time ensuring they have the latest tools and techniques to deal with the catastrophic scenes already witnessed this century. APF

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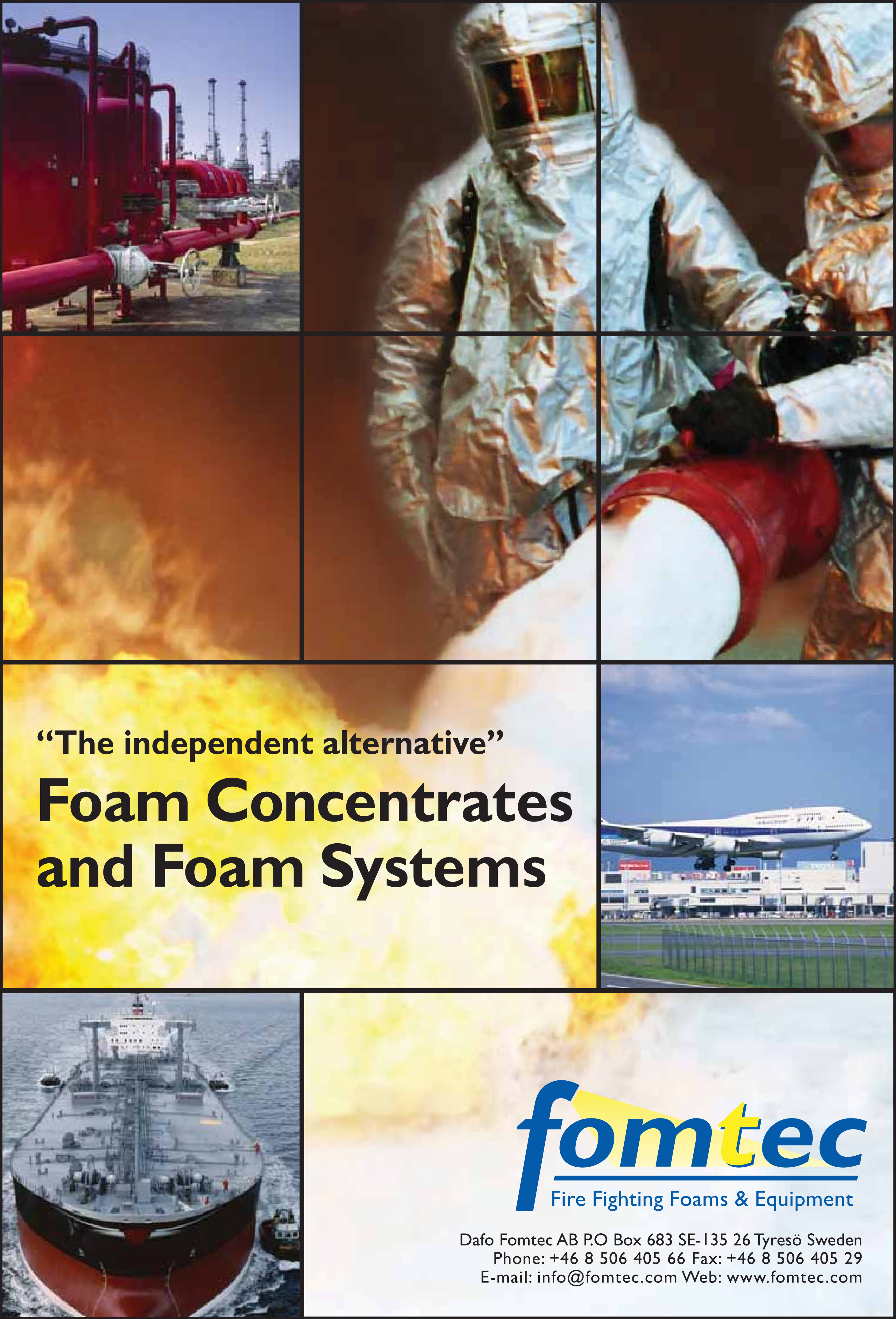

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Ethanol – Providing Answers to New Firefighting Challenges

The use of ethanol has increased significantly, creating new challenges for first responders. So much so that SP Fire Technology and the Swedish Petroleum Institute have taken the initiative and developed a proposal for a research project on ethanol tank firefighting called ETANKFIRE.

In the 2007 Spring Council, the EU agreed on targets to cut greenhouse gas emissions by at least 20 percent by 2020. To have such an impact on the environment and reach the emission targets it is essential to have a successful introduction of a broad bio-based economy, which includes the use of ethanol fuels.

The main use for ethanol is for low blending in petrol, but it is also used as E85 and "diesel ethanol". From this year, the acceptable proportion of ethanol in low blended fuels will increase from five percent to ten percent in Europe. Similarly, in the USA, the use of ethanol fuels has increased dramatically during the last decade, where presently the ethanol content in the gasoline sold is nominally ten percent but there are ongoing discussions to increase this to 15 percent.

The obvious consequence of increasing the volume of low blended ethanol, both in Europe and the USA is that the volume of bulk ethanol transported, handled and stored will increase dramatically in coming years. The diameter of the storage tanks is also increasing, making a fire and ensuing firefighting operations a significant challenge. However, experience of tank firefighting involving ethanol or other water miscible fuels is very limited and those few tank fires that have occurred have resulted in burn out rather than extinguishment.

Ethanol and Petrol

Ethanol differs from petrol in several important ways.

The most significant differences in terms of fire performance relate to the ability to extinguish a fully developed fire using traditional firefighting methods. However, the flammability properties and the burning behaviour are also different and have to be taken into account both in pre-planning and actual incident management.

The most important differences from a fire extinguishing perspective are that ethanol is a water miscible fuel and the large fuel depth in a tank. Some test data concerning foam fire fighting of ethanol fuels and other water miscible products is available, even for reasonably large scale scenarios, but they all represent spill fire conditions. During the last decades, SP has conducted several large test series using methanol, ethanol and acetone as fuels. Clearly these tests give important information but knowledge is still lacking concerning how to extinguish tank fires containing water miscible fuels.

The problems relating to firefighting ethanol fires has also been an important issue in the USA. A series of fire tests were conducted in 2007 according to UL 162 by the Ethanol Emergency Response Coalition (EERC). The tests on E95 showed that the requirements of UL 162 were only fulfilled when using an AFFF-AR and Type II (gentle) application.

Further, existing test standards for alcohol resistant foam concentrates (such as ISO 7203-3, EN 1568-4, and UL162) represent spill fires, as they all employ thin fuel layers and short pre-burn times. Even spill fires will represent a firefighting challenge, but provided alcohol resistant (AR) foams can be used and gentle application is possible, extinguishment is at least theoretically feasible.

Experience from small scale fires shows that radiation is lower from an ethanol fire compared with petrol. However, there are indications that the opposite may be true in a large scale fire based on observations made during a series of fire tests conducted on a 200 square metre mixture of acetone and ethanol. Measurements indicated that the heat flux from the acetone/ethanol fire was about twice that of petrol in this scale although petrol produced significantly higher heat radiation in small scale tests.

However, as tank fires are usually extinguished using large capacity foam monitors, gentle application is not possible and therefore extinguishment cannot be expected. A tank fire presents a more severe situation compared to a spill fire due to the large fuel depth, which essentially removes or severely limits the dilution effect from the firefighting foam. Also the large physical dimensions of a tank make gentle application of the firefighting foam impractical. Further, the pre-burn time is longer than that expected in a spill fire, thereby increasing the temperature of the fuel and creating hot steel surfaces making extinguishment even more difficult.

Other important differences compared to petrol relate to the flammability properties and burning behaviour of ethanol. In a closed vessel or a tank, pure ethanol forms flammable fuel vapours at a temperature range of about +12°C to about +40°C while petrol needs to be below about –20°C for this to happen. Ethanol fuels, such as E85, have a flammability range between pure ethanol and petrol, the exact range depending on the specific composition. The consequence of this is that the possibility to create flammable conditions in a storage tank containing ethanol or ethanol fuels, and thereby the risk for ignition, is greater for ethanol compared to petrol.

The burning behaviour of ethanol is different to that of petrol in that ethanol typically burns more efficiently than petrol. This potentially translates into a significant difference between large scale ethanol fires compared to large scale petrol fires. The issue is further complicated by the fact that the size of the fire has an impact on the burning behaviour of the fuel.

Experience from small scale fires shows that radiation is lower from an ethanol fire compared with petrol. However, there are indications that the opposite may be true in a large scale fire based on observations made during a series of fire tests conducted on a 200 square metre mixture of acetone and ethanol. Measurements indicated that the heat flux from the acetone/ethanol fire was about twice that of petrol in this scale although petrol produced significantly higher heat radiation in small scale tests. The reason for this is probably that, as the scale increases, petrol fires generate increasingly large amounts of smoke that tend to

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block the visible parts of the flames thereby reducing the heat radiation.

An acetone/ethanol fire is almost free from smoke, and the associated heat radiated is therefore not dissipated by smoke. It is not unlikely that this would also be true for ethanol fuels. Indeed, such observations were made during the Port Kembla ethanol tank fire. One consequence of this phenomenon could be an increased risk for escalation and an increased complexity in firefighting operations due to higher heat exposure of personnel and equipment.

An acetone/ethanol fire is almost free from smoke, and the associated heat radiated is therefore not dissipated by smoke. It is not unlikely that this would also be true for ethanol fuels. Indeed, such observations were made during the Port Kembla ethanol tank fire. One consequence of this phenomenon could be an increased risk for escalation and an increased complexity in firefighting operations due to higher heat exposure of personnel and equipment

ETANKFIRE

Although tank fires in general are rare, and the number of known ethanol tank fires to date is presently low, extensive fire protection measures will be required in storage facilities, based on various national laws and regulations.

Further, the number of ethanol tank fires will no doubt increase as the volume of ethanol used and stored increases in the future. Typically this translates into significant investments, both in preventative and risk mitigation measures, including preparations for firefighting in event of a full scale tank fire. However, as practical experience is very limited, and the standards for fire protection lack specific information concerning ethanol and similar fuels, there is a clear risk that such investments will not provide the fire protection level expected.

The main goal of the ETANKFIRE project is therefore to provide a platform of knowledge to ensure proper investment in the fire protection of ethanol storage plants.

This will involve gaining information both regarding the large scale burning behaviour of ethanol fuels and the development and validation of a methodology for firefighting tank fires containing ethanol fuels. In order to achieve this goal, it will be important to provide an understanding of the differences between conventional firefighting of spill fires when compared with tank fire situations containing water miscible products. The main differences that are foreseen are:

- Tank fires mean increased depth of fuel and less dilution effects during extinguishment.
- Longer pre-burn time increasing the fuel temperature and the foam destruction.
- Difficulty in achieving gentle application of the foam using the most common firefighting techniques (mobile foam monitors). This might require different equipment, tactics and perhaps even the use of other types of extinguishing media.

In order to optimise the test design in the project, the intention is to start with a test series on a laboratory scale to investigate the relative influence of the three factors mentioned above. Based on the results of laboratory tests, the most promising extinguishing methods or media will then be selected for further evaluation and verification in a larger scale or scales. Questions regarding the burning behaviour and heat radiation from ethanol fuels will primarily be investigated in large scale tests. During the initial phase of the project, a literature review will be made to ensure that existing test data and experience from real tank fires is identified.

Although the project will be focused on ethanol-based fuels, it will provide important information that will also be applicable to other water miscible products.

International funding

The fire protection issues related to ethanol are international in character and the aim is therefore to involve stakeholders on an international basis. In order to present the ETANKFIRE project plans in more detail and discuss the plans with various stakeholders, various information activities are ongoing.

The project idea was presented to the LASTFIRE group in April and recently a workshop was held in London with approximately 35 representatives from the oil industry, fire protection companies and regulators. The workshop offered an opportunity for these stakeholders to provide input to the project plan in its present form and to identify themselves as potential participants and sources of funding of the project. A second workshop is planned in the US on November 1st in Kansas City to reach out to American stakeholders, see project website (at left) for details.

An initial Steering Committee will be formed by those willing to participate in the funding of the ETANKFIRE project in order to take part in the final detailed planning, including the choice of venue for the large scale tests. At present time, funding is secured from two participants (the Swedish Fire Research Board and SPI) and a number of other stakeholders have indicated a clear interest in participation. The aim is to launch the project late 2011 or early 2012.

Henry Persson is Project Leader and **Francine Amon** is a Senior Scientist at SP Fire Technology

For further information, go to www.sp.se/en/index/research/etankfire

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Skipping to Second Generation of Fire Suppression Agents

Lessons learned in North America and the EU about the next-generation Halon alternatives

Kurt Werner

3M

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3M

Halon has been a popular clean fire suppression agent utilised to protect computer rooms, historical archives and other high-value assets where a water-based system should not be used. Because of Halon's potent ozone depletion potential, its production was phased out under the Montreal Protocol and it has not been manufactured in the Asia Pacific (APAC) region since 2010.

As the APAC fire suppression industry evaluates alternatives to Halon, it may benefit from the experience gained in the United States (U.S.) and Europe (EU) over the past 20 years, as they were faced with transitioning to alternatives and replacing or significantly modifying their Halon systems. This was not only expensive but also inconvenient. Understanding these experiences provides the APAC region with the unique opportunity to skip over turbulent first-generation Halon alternatives that, although they addressed stratospheric ozone depletion, are now under pressure because they are potent greenhouse gases.

Clean Agent Fire Suppression Options

During the Halon phase out, many in the U.S. and EU began looking into other fire protection agents that did not damage the ozone layer and would not be regulated for environmental reasons now or into the future. One of the most popular alternatives to Halon at the time was hydrofluorocarbons (HFCs). HFCs are man-made compounds used in refrigeration, air conditioning, insulating foam, aerosols, medical devices, solvent cleaning and fire suppression systems. One of the more widely used examples in the fire protection industry is HFC-227ea (FM-200 brand), considered a first-generation Halon alternative. Compared with Halon, HFCs have better environmental characteristics. The ozone depletion potential of HFCs is zero, but their global warming potential (GWP) and atmospheric lifetimes do not rank so well. The GWP of HFC-227ea is 3,220. This means it is 3,220 times more potent than CO_2 in its effect on global warming and it has an atmospheric lifetime of 34 years.

HFCs used in fire protection have a higher GWP than those HFCs used in other applications. It has been reported in the Proceedings of the National Academy for Sciences that if nothing changes, HFC emissions are likely to be equivalent to between 9 to19 percent of global greenhouse gas emissions by 2050.

Not all fire suppression agents are created equally. Fortunately, those in the APAC region can learn from these lessons and can skip the first generation Halon alternatives and go directly to a generation of sustainable fire protection. These chemistries, including water mist, inert gas, CO_2 and FK-5-1-12, a fluoroketone, branded 3M Novec 1230 Fire Protection Fluid, are not likely to be regulated now or in the future.

Water mist, inert gas and CO_2 are suitable for

Group Substance	100 Year Global Warming Potential
Group 1	
HFC-32	675
HFC-41	92
HFC-125	3,500
HFC-134	1,100
HFC-134a	1,430
HFC-143	353
HFC-143a	4,470
HFC-152	53
HFC-152a	124
HFC-161	12
HFC-227ea	3,220
HFC-236cb	1,340
HFC-236ea	1,370
HFC-236fa	9,810
HFC-245ca	693
HFC-245fa	1,030
HFC-365mfc	794
HFC-43-10mee	1,640
HFC-1234yf (HFO-1234yf)	4
HFC-1234ze (HFO-1234ze)	6
Group II	
HFC-23	14,800

use in some applications but they have limitations. Water mist, for example, damages paperwork and electrical and computer installations, while CO_2 can be lethal. Next generation Halon alternatives like the 3M fluoroketone, however, have proven performance and are not likely to be included under regulatory control. FK-5-1-12 fluroketone fluid has an ozone depletion potential of zero with a global warming potential of one and an atmospheric lifetime of just five days. It does not damage sensitive equipment, paper or furnishings and leaves no residue. The fluid is stored as a liquid, making transportation of the fluid much safer and easier than the alternatives. This clean agent fluid has been used successfully in the past seven years in data centres, telecommunication centres and other types of high value, critical applications, as well as archives and museums and in the marine and oil and gas industries. In fact, the fluid can help earn innovation credits toward meeting the U.S. Green Building Council's Leadership in Energy and Environmental Design Certification (LEED).

With the life span of a building being an average of 30 to 40 years, fire protection systems need to have similar life spans to avoid replacing or reconfiguring the system. As those in the U.S. and EU discovered, doing so is costly and disruptive. Decisions about fire protection need to be for the long term and the type of extinguishing agent used is an important part of that decision. It is tempting to think that lessons would have been learned and that the Halon story could never be repeated. The APAC region has the opportunity to learn from these experiences.

Regulations on HFCs

The future of HFC-based fire protection systems is unclear. There has been a lot of confusion within the fire protection industry about the ultimate impact of global policy, legislative and regulatory initiatives on HFCs. Governments continue to discuss efforts to phase down HFC production under the Montreal Protocol and there are independent efforts to limit their use through regulatory actions already available to the U.S. Environmental Protection Agency (EPA) and in the European Union. Given that there are alternatives to HFCs with substantially lower environmental impact, it seems likely that governments will ultimately limit production of HFCs or specifically limit their use in fire protection systems.

The fate of HFCs in the U.S. and EU fire protection market is unknown and not all HFC markets will be affected the same way. Some applications within air conditioning, refrigeration and foam blowing sectors have no viable alternatives. Fire protection however, has other alternatives. In the years to come, many issues are going to be impacting the fire protection industry and moves to control HFCs have already started.

Phase Down of HFCs

The alarming growth in the use of HFCs as replacements for ozone depleting substances has increased attention on this class of materials as a significant future contributor to global warming and climate change. A production phase-down would lead to higher costs for HFCs over time. HFC producers may turn their commodity HFC markets back into specialty markets by introducing new chemistry in refrigeration and air conditioning but the increased cost of replacement chemistry may not be favourable for HFCs sold into fire protection. If an HFC production phase-down takes hold, applications where low cost alternatives already exist will be the first to transition to alternatives. Fire suppression would likely be one of the first sectors to move away from HFCs.

In May of 2010, the U.S. EPA received a petition to selectively remove HFCs from the list of acceptable substitutes under the EPA's Significant New Alternatives Policy Program (SNAP). This move could have a large impact on the fire protection sector where next generation alternatives are readily available.

While the future of HFCs is unclear, what is clear is that those in the APAC region will need to convert their traditional Halon business to more sustainable fire suppression. First-generation HFCs may not be the right choice however, because of their high GWP and atmospheric lifetimes, and because they will likely become more difficult and expensive to maintain. In addition to looming environmental regulations, HFCs are also undergoing supply chain difficulties, making fire suppression system planning more challenging than ever. Uncertainty about the availability of raw materials and feed stocks, the status of environmental regulation and now supply disruptions, have turned the marketplace on its head. With all of this uncertainty, switching from Halon to first generation HFCs is no longer a good idea. The countries in the APAC region have the good fortune to have access to a proven clean agent fire protection technology that is truly environmentally sustainable. APF

Kurt Werner is Environmental Affairs Manager at 3M.
George Ip is a senior application development specialist for 3M

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Decade of Disaste on Firefighter Trai

A decade of disasters has increased the demands placed on firefighters. New training systems help departments provide improved training.

Maureen Lander

Action Training Systems

The past five decades have seen firefighting evolve from a narrow focus on fire science to embrace extensive training for pre-hospital medical care and other specialised response skills. In the past decade, however, public pressure for even higher levels of trained responders has increased as a result of an unparalleled string of disasters.

On 22nd May 2011, the deadliest tornado in 50 years ripped through Joplin, Missouri USA leaving a swath of destruction ten kilometres long and over one-and-a-half kilometres wide. "There was panic – firefighters were pulling themselves out of the debris and then helping others," said Mike Bettes, a meteorologist from television's Weather Channel who arrived ten minutes after the tornado touched down.

What is shaping up to be the most costly tornado season in US history comes just months after Japan's earthquake and tsunami devastated the country's northern coast, killing over 24,000 and touching off the worst international nuclear emergency since Chernobyl. It had only been eight months since floods left one-fifth of Pakistan under water. Three years earlier, a cyclone in Myanmar killed at least 146,000 people.

The list goes on. In fact, the top five natural disasters of the past decade caused more than 540,000 killed or missing, according to the website World Weather Post. Time magazine dubbed it "The Decade from Hell." Some would argue it started on September 11, 2001, when more than 400 emergency responders lost their lives trying to save others from the terrorist attacks on New York and the Pentagon.

These catastrophic events, along with the intense media coverage they receive, have changed the public's expectations of firefighters. The pressure has never been greater on departments to train for most any emergency, medical or otherwise, whether it is a minor car accident or a devastating terrorist attack.

Evolution of Training

Until the 1960s, firefighter training was basic and limited mostly to fire science. Then in 1966 Cardiac One was introduced in Ireland. Equipped to treat pre-hospital cardiac patients, it was known

rs Puts Pressure
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as the world's first hospital-based ambulance. That same year, *Accidental Death and Disability: The Neglected Disease of Modern Society*, commonly known as The White Paper, was published. It compared wounded Vietnam soldiers to California highway accident victims. The study suggested that victims' survival rate increased through a combination of community education, stricter safety standards, and better pre-hospital treatment. The pre-hospital treatment often fell to those most commonly first on the scene: firefighters.

The 1970s saw the firefighting community broaden its services to include patient care; and by 1981, 73 percent of American fire departments provided some level of emergency medical service (EMS). This additional service meant that fire fighters were required to train for a whole new skill set.

Throughout the 1980s, procedures and protocols varied by region. Then the 1990s saw careful research that identified the most effective treatments. As the information spread, standards were developed that helped fire departments deliver the best possible EMS.

By the year 2000, professional firefighters had evolved from brigades that put out fires to being true first responders that could administer a high level of on-scene, pre-hospital medical care. But the string of catastrophic events beginning on 9/11 and carrying through to the Joplin tornado and beyond has generated a public mandate that any emergency – from car accidents to terrorist attacks to natural disasters – be met with teams of highly trained emergency responders.

Government Standards

The public's mandate for skilled responders has been met with numerous government programs in most every country. In the US, through the All Hazards Emergency Operations, issued by FEMA (federal Emergency Management Agency), firefighters are expected to train in areas that include but are not limited to:

- Hazardous materials.
- Nuclear disasters.
- Atmospheric contamination.
- Flooding.
- Mass casualty incidents.
- Explosions.
- Structural failures.
- Plane crashes.
- Bombs.
- Pandemic illnesses.

In addition, the post 9/11 Presidential Directive 5 had a stated purpose "to manage domestic incidents by establishing a single, comprehensive national incident management system." It also called for a "core set of concepts, principles, terminology and technology within the incident command system." This directive added yet another level of training requirements for first responders.

Fire departments are working hard to meet the challenge of training its firefighters to a high level of competency in diverse disciplines. Yet as training requirements are on the rise, budgets are being reduced, especially in countries caught in the economic downturn. Departments are looking to advances in training methods and cost-reducing delivery systems to help them close the gap between training and funding reality.

While there is no simple solution, capitalising on new technologies and decades of refined training may help. Training officers worldwide are discovering a tool box of delivery systems that work well together and save money when compared to the more traditional approaches. This latest training leans toward a multi-media, multi-dimensional, and multi-disciplined approach.

New Training Technology

The traditional training classroom is most likely the best environment for new topics or courses on leadership development or how to conduct an evaluation. But classroom instruction tends to be boring and therefore a poor learning experience for the participants. Multi-media tools, such as interactive video or simulations, can vary the pace, motivate the learners, and enhance learning. Breakout sessions provide hands-on opportunities with simulations. Teams can practice, for instance,

with SimMan, the next-generation mannequin that has a varying pulse, bowels sounds, a multi-venous IV arm, and can be intubated.

Simulation tools are a popular alternative to dangerous and expensive real-life training drills. They offer instant, in-station training that is flexible and easily repeated. With simulation, instructors are able to control the situation, which means they can determine which skills are taught, reinforced, and evaluated.

Fire simulation software, like StageIT from Action Training Systems, allows a department to video a local facility and then super-impose fire or smoke onto the interior or exterior. Simulated victims can be added, along with other obstacles, as the instructor asks, "What would you do?" Audio can also be added, such as a roaring fire or running chain saw. This type of training is used to generate a life-like feel and real-scene experience in a simulated classroom environment.

Another effective simulation is available for apparatus drivers. Sitting in a chair surrounded by screens, it is similar to a road racing video game. The participant is able to improve skills or demonstrate competencies such as speed and traffic control. The vehicle can be changed from an engine to a ladder truck to an aide car.

A lot of this technology is new, yet improvements have already been made thanks to training officer feedback. When the first fire simulation software came out, pictures or video could not be added and it did not interface with Windows. Today it is much more user-friendly and continues to improve with each released version.

Simulation is not the only technology-driven training tool. Computer-based training (CBT) is a relatively new application that also offers flexibility and cost savings. CBT was first met with the assumption that it was an inferior training experience when compared to traditional classroom instruction. According to an article in *Professional Safety* by Scott Lawson, a study was conducted to determine whether that assumption was correct.

In the study, two test groups were given an examination, then instruction, then the same examination again. The group instructed using CBT improved their score by an average of 53 percent, while the traditional classroom group improved by only 14 percent on average. The groups were tested again three weeks later. The CBT group again showed better retention over the classroom instruction group.

Improved retention is not the only benefit of CBT. When the fire department of Independence, Missouri, opened a new, $2 million training facility, Assistant Chief of Training, Steve Bailey, explained the situation: "We can not take everyone out of service at one time to train, so our department broke our crews down into four training groups. To give one class to everyone in the department, we had to teach it four times for each shift, times three shifts, with one make-up class for each shift. So, to teach one class, we had to give it 15 times. We also had to move trucks all over our town of 200-plus square kilometres to get personnel to our training room."

Looking for a more cost-effective training process, Bailey discovered Action Training Systems' CBT programs running on the Iluminar Learning Management System (ILMS) and was impressed with the quality of the video content. "When I did a demonstration of the Action Training Systems' CBT, it was actually interesting," he said. "The video was interesting to watch and if you answered questions incorrectly, it took you back to show what mistake you made. There was no way to hurry and guess your way through it or cheat, which I really liked."

Since 2008, Bailey has purchased about 80 courses, almost the entire ATS library. "With ILMS, we can assign the class to everybody and it is easy to track," he said. "We run reports to tell us who has and who has not had the training, and we can teach to the entire department without pulling a truck out of station and driving across town to the training facility, so now they can stay in service."

Technology for Testing

A close cousin to CBT is computer-adaptive testing (CAT), and Gregg Margolis, associate director of the National Registry of Emergency Medical Technicians (NREMT) is a big fan. He likes the move away from paper and pencil testing because he feels that CAT gives a more accurate measure of skill. As he explains it, with each correct answer the questions become more difficult and, conversely, with each incorrect answer the questions become less difficult. The test is geared so there are about as many right answers as there are wrong answers.

"People should try to get out of their minds the notion to get 70 out of 100 correct," Margolis explains in an interview. "It is not going to happen in adaptive exams. We have all taken many linear exams so it is natural to think in those terms." Margolis goes on to explain that the adaptive nature of the test means that everyone will score about the same; however, a high achiever will get increasingly difficult questions until their maximum competency is revealed. Margolis also likes that the testing environment is secure and that the results are instantaneous.

While technology has become more common

and user-friendly in training, today's newest emerging tool is social media. Facebook is used to make announcements, to communicate within and between departments, and to connect to departments overseas. There is a vast library of videos on www.youtube.com that includes drills, extrications, explosions and close calls; others are simply entertaining. Twitter, StumbleUpon, and other social networking sites are only now being used by the fire fighter training community.

As the demands on emergency responders have expanded, there has never been more pressure on firefighters to perform such diverse skill sets and apply them to a multitude of incident types. The training bar is high and departments worldwide are meeting the challenge through hard work, ingenuity, and a tool box of training systems. At the same time, there are many companies providing innovative products to help improve the training experience.

One such company is Action Training Systems. Action Training Systems is a multi-media development company and worldwide leader in innovative training systems for emergency responders. Established in 1988 in Washington State, USA, and led by President and CEO George Avila, ATS has produced more than 80 courses and 200 products for municipal fire fighters, industrial firefighters and EMS, including training on DVD and CBT (computer-based training) formats, lesson plans, PowerPoint presentations and the StageIT simulation software. ATS teaches only to American national standards such as NFPA for firefighters and NEMSES for EMS personnel and to ensure the authenticity of the content, they shoot in real life locations and only use real emergency responder personnel for demonstrations in their videos. **APF**

Maureen Lander is responsible for Content Development at Action Training Systems

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Helmets Design – Standards and Culture Differences

Personal Protective Equipment (PPE) is different from other equipment used in firefighting and rescue primarily because of the first P – Personal.

Of all equipment, PPE plays the most significant role in keeping personnel safe, therefore allowing them to effectively perform the often arduous tasks required of them. However the personnel who rely on the equipment often have little or no say in what equipment is issued. This responsibility usually falls upon a select group of experts who thoroughly assess equipment from many manufacturers and choose what they feel best suits their operational and budgetary requirements. This is not an easy task and it is a responsibility not to be taken lightly.

There are many factors to consider when making appropriate PPE selection. This article deals primarily with two:

1 Safety standards.
2 Cultural Influences.

The very minimum measurement of a product's ability to provide protection is the relevant certification that it carries to a particular standard. Standards vary greatly both by region and by application.

Work on keeping standards up to date with the requirements of the industry and the equipment available is an ongoing task. Helmet standards are no exception. More stringent operational requirements of helmets are largely a product of safety concerns in demanding operating environments. Despite the progress made in updating the various standards, some helmet manufacturers are already offering new designs that stretch the basic concepts of new standards. These commercial realities are likely to continue and it is imperative that the standards bodies are up to the task of ensuring these innovations are reflected in the standards, and that they do not affect (if not bolster) safety in the field.

The 2008 version of EN443 resulted in requirements that far exceed those in the preceding 1997 standard. Changes include more stringent design requirements and testing of the face shield and eye protectors, neck protector, shell and retention system. The result is that the new standard offers far superior protection to the former version.

The marketplace drove the incorporation of design types and the design innovations offered by manufacturers to meet this demand.

Perhaps the most significant change to EN 443 was the addition of a flame engulfment test similar to the test that can be applied under Annex E of EN 469:2005 to clothing certified to that standard. This is a major change that could well see a significant number of existing helmets off the market, or certainly requiring major sub-component upgrades. The test involves kitting a torso in full EN 469 jacket, SCBA mask, hood, and helmet complete with face shield, neck protector and Nomex chin strap. Because the flame and heat is directed both at the jacket as well as directly at the lower edges of the helmet for ten seconds, the flame and heat rises from under, around and potentially inside the helmet. The standard requires the temperature at the tip of the burners to be 950°C, plus-or-minus 50°C.

Cultural and design influences were also present. The penchant of European firefighters for the so-called "jet-style" helmets created a requirement for manufacturers to meet design helmets that there in line with market requirements. Of course, safety is paramount, and an assessment must be made of any design changes and the manner in which they may affect the helmet operation and safety. These marketplace requirements resulted in the incorporation of design types into the EN443 standard: Type A (traditional helmets) and Type B (helmets). Pacific Helmets has a long history of producing helmets in both styles.

The update of the Asia-Pacific region standard AS/NZS4067 (Structural helmets only) is progressing thanks to the work of the SF.49 committee, with an updated version of the standards now only months away. The committee is clearly aware of the changes to other international standards and incorporated those that are appropriate for firefighters in the region. The requirements here are, of course, different. One example is that higher ambient temperatures mean firefighters have, in the past, preferred to wear traditional (Type A) helmets, although this is now changing. Another is to do with the fact that fire appliance accidents are responsible for the largest proportion of firefighter deaths in Australia and New Zealand.

In America a new version of the NFPA 1971 helmet standard is due for publication next year. This too will see improvements to the minimum safety requirements of structural fire helmets. In the past NFPA 1971 document writers appeared to get themselves in a knot about the "jet-style" helmet shapes appearing in their market. Many parts of the standard created confusion when applied to the jet style shape of helmet. However changes to the next edition of the standard should clarify many of these contentious points.

Culturally, many crews in both Asia Pacific and the USA now seem to be willing to at least explore the option of a jet style structural helmet. That is not to say that one is superior to the other, but simply to point out that cultural perspectives do change. Both styles have their advantages and drawbacks. The main concern is that firefighters are happy to wear them and not tempted to take them off as soon as possible. Factors influencing this include weight and comfort.

Weight is an important consideration. Innovative manufacturers are well aware that for almost 90 percent of the time a helmet is worn, many front-line fire crews are wearing products that are too heavy, perhaps over-protective, impractical or inappropriate to the job at hand. By far the majority of tasks facing structural firefighters have little to do with structural building fires, yet the helmet they wear is designed assuming maximum risk and therefore has maximum weight and size. The vast majority of tasks they face involve RTAs, rural firefighting, line or water rescues, paramedic operations and even rescuing cats out of trees. Heavy, bulky, inconvenient helmets simply get removed when conducting many of these tasks and fire crews are looking for vastly better designs.

In the past this over-protection has been necessary because fire brigades have had to protect their crews and it has not been possible to separate various risk factors and wear helmets appropriate for the task. This may be fine in the US market where bigger and heavier always seems to be better, but excessive weight and size is an issue for Asia-Pacific firefighters just as it is in Europe.

Similar problems affect helmet manufacturers attempting to update designs of helmets for Asia-Pacific region fire brigades. The current standard sets lateral vision and other design restrictions that are not easily avoided by modern helmets with internally rotating face shields. As mentioned earlier, the new edition of EN443 establishes two types of helmets (A & B) and these allow traditional style Type A helmets to cover less of the head than Type B helmets that must come down further around the head and provide much greater shell cover. These designs should mean much improved thermal and impact protection for firefighters.

These developments typify the difficulties facing standards committees. Safety helmet development is proceeding so quickly that it is almost impossible for committees to keep up and manufacturers at the forefront of their game are driving designs forward very quickly. Traditional helmet designs like those typified by many old US and European designs may have held sway, but safety conscious brigades are looking for superior design options that offer their crews lighter-weight, more innovative helmet designs and, most importantly, greater safety.

Cultural issues affect the design of the helmet almost to the same extent as, if not more than, standards. All PPE must be culturally acceptable in order to ensure that personnel actually wear it. This means that the design and shape of a helmet must be what is expected of a fire helmet in any particular country. We have touched on the difference between traditional type helmets and the "jet-style" style helmets. The design differences between these two categories are vast.

Another cultural aspect that influences both the design of the helmets and indeed the drafting of the standards is firefighting techniques themselves. Different cultures have developed contrasting approaches to the way fires are dealt with. This has resulted in different demands being placed on the PPE. Firefighters in some countries seem to run into a fire and look for a tap, whereas others have very much a stand back approach. The demands placed on the PPE are reflected in these approaches.

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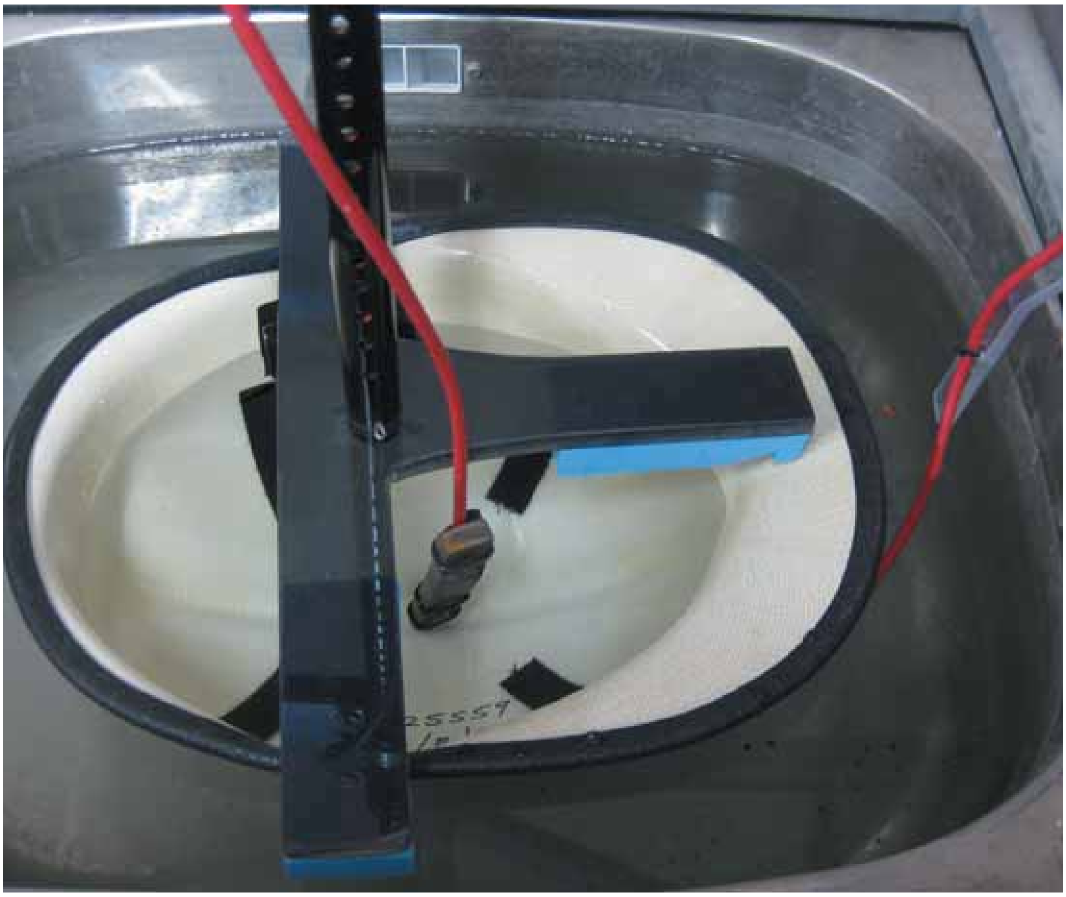
Standards – Requirements and Comparisons

The AS/NZS 4067:2004 and NPFA 1971:2007 standards are largely similar. The most significant variations are between these two standards and EN 443:2008. For analysis purposes in this instance, AS/NZS4067:2004 is used as a reference standard as this incorporates many requirements of the other two standards, and some not present in EN 443:2008 and NFPA 1971:2004.

Flammability Resistance Test:
This is a special test found only in AS4067. The helmet shell is subjected to a 200°C radiant heat source for 60 seconds. This is followed immediately by subjecting the shell to a Bunsen burner flame for 15 seconds, while the radiant heat continues.



Convective Oven Heat Test:

In addition to the test above, an AS4067 certified helmet has to be able to retain its shape and not melt or drip after being exposed to heat at 230°C for 3 minutes.

Durability Test:

This is a unique preconditioning test that is given to the helmet shell, prior to any shock impact tests. The helmet is dropped from a height of 1.5 metres onto a flat concrete surface twice, effectively "softening" the shell surfaces, especially the crown area, and therefore affects the shock impact reading in a negative way if the shell integrity is compromised.

Shock Impact Test:

Other standards only test helmets to the top 30 degrees from the centre crown. AS4067 helmets are tested over a much wider area of the helmet, down to as far as 60 degrees from the centre line. This provides not just top impact but also side, front and rear impact in the event of other types of potential injury, including falling from a ladder or through a building, or being involved in a vehicle accident; the leading cause of fatalities in Australia/New Zealand.

Electrical Insulation Test:

The tests conducted on AS4067 certified helmets are far more severe than any other international standard. The voltage applied to the helmet, (be it conductive helmet test or wet shell test), is a deadly 2,200V and the duration is as long as one minute. Tests in other standards use only 1,200V for duration of just 15s.

Internal Temperature Rise Test:

If you think fighting a large structural fire is hot work imagine if while fighting this fire the inside temperature of your helmet rose 25°C, because that is the temperature rise permitted in other standards. AS4067 allows a maximum temperature increase of only 10°C and in our full liner, multi-layer helmets the temperature increase is less than 3°C.

Outside the Major Standards' Regions

The issue for some Asian fire brigades is that historical helmet protection levels have been so low as a consequence of the protection afforded by domestic manufacturers who have manufactured extremely low specification helmets. This is not true of all brigades, for the Hong Kong, Singapore, Taiwanese and some Korean fire brigades have been equipping their crews (both fire and paramedic) with EN 443 compliant helmets for some years. This trend is becoming more common in both South Asia and the Indian sub-continent. The result will be a significant reduction in head trauma.

For many of these countries, the real issue in the first instance is one of raising the basic helmet and PPE performance standards. Whether they chose European CE or AS/NZS standards, the benefits will be similar and front-line crews will be the beneficiaries. For other fire brigades in Australia and New Zealand, the traditional shape of helmet is likely to change to half or full jet-styles as the standards document updates hopefully next year. With multi-function/multi-layer helmets now becoming available, stand-by for quite radical design shapes and features on firefighters' heads very soon.' **APF**

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For further information, go to www.pacifichelmets.com

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Gloves – A Testing Issue

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Glove testing varies depending upon which standard is applied. It is certainly not a case of "one size fits all".

The fundamental differences between the most important international standards for structural firefighting gloves, Australia's AS 2161.6-2003 (Occupational protective gloves – Protective gloves for firefighters – Laboratory test methods and performance requirements), the USA's NFPA 1971(Standard on Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting) and Europe's EN 659:2003 + A1:2008 (Protective gloves for firefighters) are the various test methods and their requirements. Take just two examples: mechanical requirements (abrasion); and thermal requirements (radiant heat).

The abrasion is tested to the Australian standard in both the palm and upper hand, whereas Europe's EN standard requires this test to be carried out only on the palm of the hand. This allows manufacturers to provide a breathable, fire resistant, upper material that is in line with the climatic conditions in Australia, and responsive to the desire for a significantly improved breathability of the glove. Heavy sweating in hot climatic conditions is also intensified by the incorporation of a moisture barrier. The risk of burns in the event of a flash-over will also be significantly increased through the wet, sweaty inner lining.

Turning to radiant heat, the Australian standard requires a complete "total protection"; that is, the same requirements and features on the upper hand as are required for the palm. The European standard requirement for the radiant heat is confined to the upper hand in accordance with EN ISO 6942 (40kW/m^2 – 20 sec). Australia's AS 2161.6 has virtually the same test method but, at the same heat flux density, requires 33 sec. And this at the top and palm.

It follows that the glove will comprise an extremely large amount of material in order to meet these requirements. This can be achieved, among other things, through the use of very strong leather and the development of textile materials that pass the 33 second radiant heat requirement of the Australian personal protection equipment market. This is currently a big issue in the marketplace. The need to achieve abrasion resistance of the upper material through wear-resistant material while remaining breathable, is a challenge both for the industry and, ultimately, also on the glove manufacturer, when endeavouring to produce a tactile, dexterous firefighting glove.

In the thermal requirements of NFPA the thermal protective performance test (often referred to as the TPP rate) has a special position. Using the test method and the mathematical formula you can reach a TPP value (the target of which is 35) that measures similar seconds to the EN requirement, but rather slightly less than 20 seconds.

You still miss the NFPA requirements for the abrasion resistance, and rightly so. The NFPA requirement is limited to the mechanical performance and firefighting gloves on cut, puncture and tear resistance. This is a very important, if not critical issue, in Australia but is not anchored to the NFPA.

In reality, the field of activities of the firefighters are almost similar around the world – the same flames and temperatures – and firefighters need to be equipped with the best products to protect themselves from the dangers that threaten them.

Furthermore, there is a fundamental difference in the blood and virus resistance, as only the NFPA 1971 requires a 100 percent "tight" against body fluids and water. Australian standard requires only a water leak at Level 2 and 3 layers of gloves, but only level 3 resistance to fluids such as sodium hydroxide and sulphuric acid. The water-tightness in the European standard EN 659:2003 + A1: 2008 is only an option; but again is a resistance against liquid chemicals such as o-Xylen.

The 4th Draft ISO / DIS 11613.4 (Personal protective equipment ensembles for firefighters – Test methods and requirements for PPE used for fighting fires in structures) seeks to harmonise personnel protective equipment for firefighters; in particular the test methods and requirements for personnel protective equipment used when fighting fires in structures. In terms of abrasion and heat radiation:

- Abrasion resistance to comply with the requirement according to ISO 12947-2 AS – 8000 cycles or 2000 cycles (class 2). The current requirement EN "content" itself cycles with 2000.
- The radiant heat is required in class 3 of ≤ 26 sec (Class 2 ≤ 20 sec) – especially here, you see how "closer" to EN and AS (also based on the commonality of the test method of ISO 6942:2002 (Protective clothing — Protection against heat and fire — Method of test: Evaluation of materials and material assemblies when exposed to a source of radiant heat).
- New recording would be the viral penetration resistance: both class 2 and class 3, no penetration of Phi-X 174. This represents a substantial innovation in the field of NFPA 1971.

The list of differences – whether or not they are reasonable – could be continued indefinitely. In reality, the field of activities of the firefighters are almost similar around the world – the same flames and temperatures – and firefighters need to be equipped with the best products to protect themselves from the dangers that threaten them. **APF**

Raimund Sekyra is International Sales Director at ESKA Lederhandschuhfabrik GmbH & Co KG

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Advances in Fire B

Most firefighters hate their boots. They are typically heavy, hot, stiff, and cumbersome. They certainly do not help you perform a dangerous job more securely. And during the inevitable prolonged periods of standing around, your feet and back know that almost any other footwear would make them feel a whole lot better.

Mark Mordecai

Globe Manufacturing Company

Recent innovations in footwear construction have finally come to the rescue of the firefighter. You know that athletic footwear you choose to wear for agility, grip, cushioning, support, and outright comfort? Well now, this technology is revolutionising the fire boot.

A Short History of Boot Construction

In the beginning, fire boots were made of rubber. In fact, a large percentage of fire boots are still made of rubber today. Rubber is liquid resistant, easy to clean, pretty durable, and reasonably cheap. But they are heavy, hot, and smelly. Because rubber makes for a floppy fit, your feet and heel tend to slip around inside. And with their bulbous soles and exterior, wearing them makes you feel a little like a clown on a bad day.

Rubber boots are heat cured rather than sewn, so when they are laid up on a last (the artificial foot that gives boots their size and shape) they are limited to using relatively simple pattern pieces rather than the more complex 3D shapes that can be created by sewing. The process uses uncured rubber to piece together on the last and then the whole business is baked in an oven to cure the rubber and seal the pieces together.

The best you can say about rubber boots is that they do the job. But nobody wants to wear them.

In the late 1980s, the first leather fire boot was born using a Gore-Tex bootie liner for liquid resistance. Gore-Tex had been used in the outdoor industry for hiking and hunting boots for more than a decade, but the first to use it for making fire boots was a company spun off by the Timberland Company to make industrial boots.

Leather boots were a quantum leap better than rubber boots. They were dramatically lighter in weight and they fit ever so much better. Studies conducted by the University of Maryland in the late 1990s clearly showed improvements in firefighter physiology wearing these lighter leather boots when compared with their heavier counter-

oot Construction

parts. Although they were significantly more expensive, slowly but surely leather boots have been taking over from rubber, so much so that today leather boots outsell rubber boots in USA.

These leather boots were based on the Goodyear Welt construction that was then the construction of choice for the US Military. This construction was invented by Charles Goodyear Jr in 1869 and still relies on the stitching machinery that he patented in 1871 and was part of the enormous increase in productivity achieved during the industrial revolution. (The Goodyear Tire & Rubber Company was named after his father who invented vulcanised rubber.)

Fire boots made using the Goodyear Welt process are durable, but they are stiff even when broken in. Since the human foot flexes as much as 50 degrees when you walk and these boots do not, there tends to be significant heel slippage even in boots that are properly fitted.

In the last few years, a new construction has found its way into fire boots – Athletic (or Cement) Construction. You all know this footwear manufacturing method because it is how all athletic shoes are made. This method allows for remarkable flexibility and uses a cushioned and contoured platform that most of use choose to wear whenever we can. Without stiff welts, the boot can flex just as much as your foot, thereby eliminating the driving force behind heel slippage. With internal fit components, you can actually securely run in them.

The other advantage is that instead of a platform that is stiff as a board and flat as a pancake, boots made with Athletic Construction use a cup outsole and lasting board that is contoured like the bottom of your foot. With internal insoles to provide additional arch support and cushioning, you can stand around on the concrete for hours without your body complaining.

NIOSH Boot Studies

Recently, the USA's National Personal Protection Technology Laboratory of the National Institute for Occupational Safety and Health (NIOSH) has released preliminary data about a study that it has been conducting on the "Physiological Consequences of Boot Material and Sole Type in Men and Women Firefighters".

Its preliminary findings report a significant decrease in measured oxygen consumption for Athletic Construction boots compared with Welt Construction boots. They also found that firefighters adjusted their walking patterns and postures when wearing heavier and stiffer boots and that Athletic Construction boots increased walking speeds, while reducing step width, double-stance time and joint loading; all of which contributes to better balance. And in other tests involving boot clearance over obstacles, they concluded that Athletic Construction would also reduce the risk of trips and falls.

So, the science seems to be confirming what firefighters know the minute they put on this new generation of boots.

SATRA Testing

The new edition of the NFPA 1971 Standard (Structural Fire Fighting) has adopted the industry standard SATRA TM 144 test for slip resistance. For this test, whole boots (not just sections of outer soles) are subjected to a standard surface (quarry tile) in dry, wet, and icy conditions (although NFPA will only test wet conditions).

Of course, many parts of the world experience cold and ice where sole traction is affected not just by tread pattern and sole compound, but by the affects of temperature on the compound. Many fire boots still use a nitrile rubber based compound that becomes glass-like as temperatures drop. Neoprene rubber manages cold temperatures far more effectively, which is one of the reasons they are the material of choice for gasoline hoses – they stay flexible in cold weather.

Composites versus Steel

Firefighters require boots with crush resistant safety toes and penetration resistant insoles to protect their feet from the many hazards they may encounter. Traditionally, the protective components were made from steel.

With the advent of advance composites, steel is going the way of the dinosaur. New generations of aircraft are being made with composites because they are lighter and stronger than the metal they replace. In boots, composites can not only offer reduced weight, but because they are insulators rather than conductors, they can keep your feet warm in the winter instead of contributing to cold feet. And because they are non-metallic and non-conductive, they can add an important measure of safety around downed power lines and other electrical hazards.

CBRN Leather Boots

Research conducted by North Carolina State University has even led to the development of a CBRN Leather HazMat boot. This new solution provides all the advantages of a lightweight Athletic Construction for flexibility and fit while using a new CBRN barrier bootie and engineered leather that can be decontaminated in the field using current methods.

Now certified to NFPA 1994 Level 2, the next step for this technology is accelerated wear trials to determine the expected service life of the boots and to validate that the performance is maintained throughout this service life.

Step into the Future

This advanced technology is not coming somewhere down the road; it is here today. Fire boots using Athletic Construction, composite components, and neoprene outsoles are all the rage in the USA. Departments that have been in older Welt Construction leather boots are switching in droves and many that are still in rubber boots are finally stepping up to the latest technology.

Next time you are reminded just how much you hate your boots, make a mental note to check out the latest advances. Your feet will thank you! **APF**

Mark Mordecai is Director of Business Development at Globe Manufacturing Company

For further information, go to www. globefiresuits.com

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Towards an "Intelligent Response" to Emergencies

Markus Niederberger

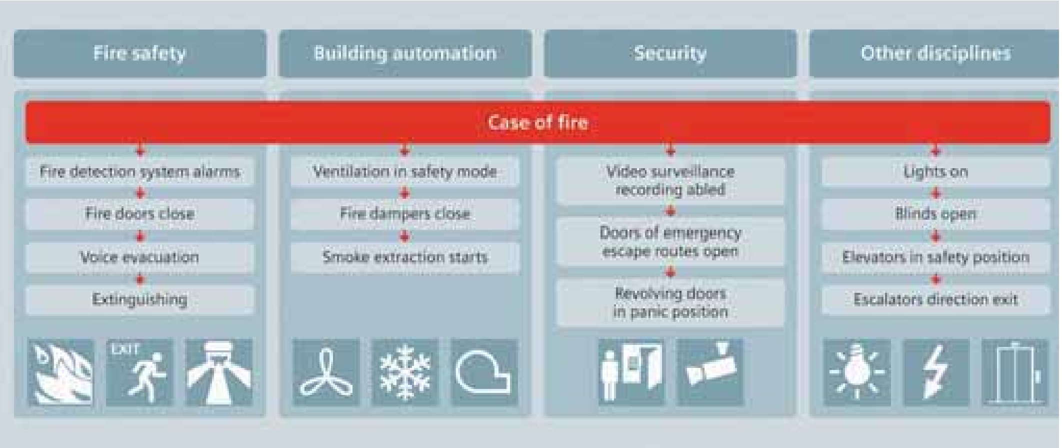
Siemens Building Technologies

Society has learned to accept fire as one of the many risks to life and property that simply must be effectively managed. Improved fire detection and protection systems, tougher construction codes, more extensive safety standards and more sensitive planning have all helped reduce the threat over recent years. But better ways still need to be found.

Undoubtedly, better ways do have to be found, not only in terms of limiting damages and costs, but also to ensure people safety, particularly as threats and our living and working environments become 'denser'. This is particularly acute in Asia where the urban population is increasing by 37 millions each year with the proportion of the population living in cities expected to reach 50 percent by 2026. This calls for a wider scope of emergency preparedness to intelligently respond to both traditional and new threats; a preparedness in which technology has an increasing role to play.

Despite all of the advances that have been made, the estimated economic cost of fire still stands at around one percent of gross domestic product (GDP) in developed countries, while 70 percent of businesses experiencing a major fire close down after three years – a stark reminder that it is not just a life safety issue. With terrorist attacks also a factor and industrial incidents, natural disasters and extreme weather claiming thousands of lives, people generally believe that their safety is more at risk than ever before.

It seems ironic therefore, that on first hearing a conventional fire alarm, many people will hardly react. Many often assume that a ringing alarm is a test procedure or an unwanted false alarm and hesitate for several vital moments before taking action. In some cases, people are unaware of the correct emergency or evacuation procedure relevant to their location. Quite simply, they do not know what to do – and when faced with the very real dangers of a genuine emergency, some people will become flustered, disoriented or even panic-stricken. Most people using a hotel or an airport, for example, will not be familiar with its layout and, in a potentially life-threatening fire, may struggle to find the nearest emergency exit. Studies have also shown that on-site response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Video surveillance recording abled
Doors of emergency escape routes open
Revolving doors in panic position
Lights on
Blinds open
Elevators in safety position
Escalators direction exit
EXIT

personnel are not immune to the effects of stress in a real-life emergency. They, too, sometimes panic and are overwhelmed by the responsibilities involved.

Addressing the Ever-wider Duty of Care

To cope with fire and other life-threatening emergencies, there is a noticeable change of priorities taking place today. Simple detection is no longer accepted as sufficient and the focus has shifted towards incident prevention and response management through emergency preparedness.

Real contingency planning necessitates the implementation of solutions that are as widely comprehensive as possible. Protection systems should be implemented to detect the very earliest signs of combustion, intrusion, attack or other hazardous event. Building owners and occupants should be prepared to react and have plans in place to safeguard people and property. Post-event analysis and reporting mechanisms should also be in place both to speed up recovery and to enable "lessons learned" to be converted into continuous improvements with regards to emergency measures and policies, as well as protection system upgrades for the prevention, detection and response to incidents.

Real contingency planning necessitates the implementation of solutions that are as widely comprehensive as possible. Protection systems should be implemented to detect the very earliest signs of combustion, intrusion, attack or other hazardous event.

Train, Retrain, and Train Again – But is it Enough?

The current focus on preparedness lies predominantly in the structural (for example, emergency stairs) and organisational (such as emergency plans) spheres, drawing from scenarios and known risks to derive appropriate response actions by first responders and building occupants. However, while training and drills are an essential part of emergency preparedness, they bring their own set of problems.

For one, effective preparedness based mainly on organisational and structural measures necessitates the meticulous and regular training of all fire/security staff, relying on their efficiency and competence (this ranges from ensuring emergency exits are left clear at all times to ensuring regular system checks), regardless of illness, holidays or changing personnel and shift rotas. In addition, they can sometimes fail to cover the need to instruct visitors and other people unfamiliar with the building and site emergency procedures.

In industries with a very international mix of staff and visitors the lack of international standards in some areas can also easily cause confusion in an evacuation situation, increasing the need for clear and appropriate training being given to all building occupants. In high-risk facilities and installations such as power stations and refineries where there is a strictly limited number of untrained visitors, rehearsed scenarios based on past event analysis and incident development can be usefully implemented. On other, less contained sites where there are large open areas, different buildings and/or large, inexact numbers of people in scattered locations, such response guidelines for the widest range of possible emergencies are usually less viable. On certain remote sites, the longer mobilisation times of the emergency services will increase the challenge. So too will the extended evacuation time of certain complex facilities such as airports, and hospitals and residential homes where the ability to self-rescue is limited and where complete evacuation is only a last resort.

Preparedness and Communication

The current megatrends of growing populations and urbanization means that there is an increasing shift to multi-tenant and even multi-purpose buildings as local authorities struggle to cope with burgeoning cities and towns, and Asia is no exception. This increased urban density coupled with the need to build ever taller buildings – Asia accounted for 34% of all high-rise buildings worldwide in 2005 – again adds to the complexity of sites and the task of providing protection throughout. The one factor in every location that can thwart many strategies is human behaviour. For instance, fire escapes carefully integrated into a well-conceived evacuation plan may ultimately

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DRY WEIGHT: **119 Kg / 262 lbs**

MCH 16/DY CAP
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POWER: **6,6 Kw**
DIMENSIONS: **HEIGHT 69 cm / 27"**
WIDTH 56 cm / 22", LENGTH 113 CM / 44.5"
DRY WEIGHT: **125 Kg / 275 lbs**

MCH-6/SH
DRIVEN BY: **HONDA PETROL ENGINE**
CHARGING RATE:
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POWER: **3,5 Kw / 5.5 Hp**
DIMENSIONS:
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DEPTH 32 cm / 12.5",
LENGTH 78 cm / 30.7"
DRY WEIGHT: **38.5 Kg / 85 lbs**

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fail when complacency creeps in over a period of time. The 2009 fire that engulfed a 44-story tower in Beijing in the brand-new complex that housed the China Central Television illustrates this risk all too well. The fire was started by New Year celebration fireworks, but experts at the time blamed building materials that were stored on the floors for fuelling the massive fire. Had the building been occupied, this would have had disastrous consequences on the evacuation of people. Luckily, the building was unoccupied at the time, but 1,000 people still had to be evacuated from the surrounding area.

Extensive analysis of recent events identified two areas as being critical for a successful emergency response – preparedness and communication. Residents, workers and visitors populating the complex sites and structures that we are now building, need the right information and at the right time. They need to be told when to remain where they are, when to move, when to evacuate and where to go. Similarly, the amount of information first responders need to obtain and process to do their job efficiently requires constant and timely communication. This includes the nature of the incident, its extent, the building layout, how many people are affected or injured, and the risk of secondary incidents (such as explosions). Just as vitally, the instructions that people and first responders are given should reflect the changing stages of the incident; they need the information that will simply and quickly take them to safety or enable them to change their course of action and incident response – without confusion and without hesitation.

The Case for a Better Use of Existing Technology

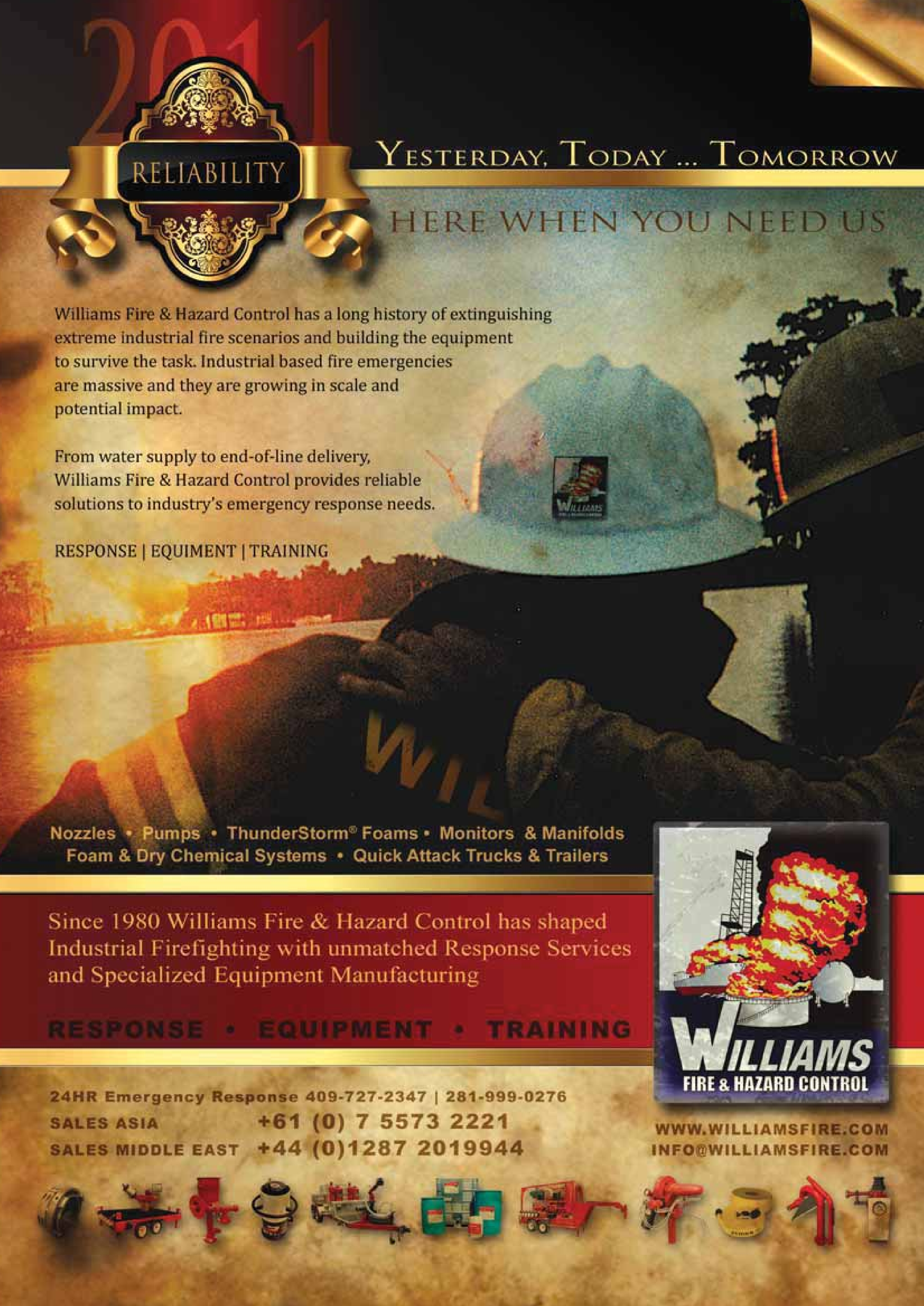
What this all means is that, to ensure efficient incident management and evacuation, there is a need to go beyond the traditional prescriptive fire safety technology arena and look towards performance-based codes and systems that can help better address the challenges and changing requirements of emergency response.

The more diverse and complex the risks and the environment, the more important it is to have a scalable and flexible management solution for alarm handling and response that can manage all aspects of safety and security. By implementing technology already in existence, we can improve our view and understanding of the situation, as well as our communication with those caught up in the situation or those required to respond to it. The industry already has several effective response solutions such as voice evacuation, automated extinguishing and danger management systems.

Voice evacuation systems are now increasingly commonplace legal requirements in many parts of Asia for rail and air transport terminals, as well as schools, hospitals, and other large facilities many of which are now housed in high-rise buildings. In any emergency situation, therefore, vocal evacuation warnings and public address broadcast can enable the safe and orderly evacuation of people from affected areas.

Due to the limited exits and increased number of occupants, a typical 18-story building may take up to 30 minutes to be totally evacuated, while a 50-story building can take up to 75 minutes. As a result, many tall buildings have implemented zoned evacuation procedures, where people go to a safe area, and wait to be evacuated. The success of zoned evacuation is dependent on quick and clear communication instructing occupants to remain in place – as most people will instinctively try to evacuate.

Generally, voice evacuation systems sound an alarm tone followed by a spoken warning, giving instructions as to whether to evacuate the building and what to do next; instructions to proceed to the relevant assembly point or not to use elevators



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being prime examples. They can also be used to deliver live information. This gives such systems a distinct advantage over bells and sounders (often ignored or misunderstood) or even voice sounders broadcasting a pre-recorded message.

An additional advantage is the capability to selectively direct announcements towards only those areas and people affected by the incident. This is particularly important in buildings such as hospitals, where a mass broadcast of an alarm or evacuation instructions would not be appropriate, potentially causing unnecessary panic among patients in non-affected areas.

Integrating Safety and Security

When safety- and security-related incidents do occur, it is obviously better if they are brought to the attention of security staff at the earliest stage possible. Efficient detection and alarm systems do undoubtedly bring significant improvements, but more so when integrated with danger management systems (DMS), which can play a vital role by providing and displaying all essential information and functions clearly and concisely to ensure that effective countermeasures are taken.

Other technologies are also already in existence, which, when put to use in an emergency response situation, will help more people escape the danger zone safely. The culture of mobile phone and instant messaging usage is just one example already in use in mass notification systems.

Best known in Asia for natural disaster warning, but already common in the US and being installed with increasing regularity in universities, schools, hospitals, shopping malls and theme parks in Europe, mass notification systems not only warn people of danger, but also provide concise instructions via live or pre-defined messages over multiple communication channels and guide them to safety in potentially life-threatening situations – inside and outside of buildings. This increasing use of the new communication channels available is also driving a re-think of how 911 calls are received in the US, whereby technology that would enable emergency call centres to also receive text messages, pictures and messages are also under review.

Better Still – Intelligent Response Systems

The present move towards intelligent response systems is driven by technological advance in IT and communications. With the adoption of open standards, already well established in the building automation arena and gaining momentum in some sectors of the safety and security industry, the capacity for innovation is immense. Smart buildings are already becoming a reality today, providing tremendous efficiency gains in the fields of energy management. They do this by harnessing building data (temperature, air quality, etc) and triggering the relevant response, at the right time, from building automation systems accordingly.

Similar efficiency gains can be obtained in the field of incident response: it is already increasingly common – though not common enough – for fire detection systems to be integrated with voice alarm and mass notification systems, automated extinguishing, emergency lighting – and building management and security systems for controlling smoke, lifts and doors in any life-threatening situation. But response systems of the future – these so-called intelligent response systems where the system in place involves a variety of these fully integrated, multi-modal technologies – will take this integration further still.

Future technologies should enable a "demand-controlled" response to incidents, where systems would be able to analyse all relevant data that has been collected from the thousands of sensors and field devices and the various management systems from buildings over the site. They will then trigger the relevant system response mechanisms in relation to the nature, size and criticality of the incident, and enable the automated provision of dynamically updated and targeted instructions to everybody concerned, regardless of their circumstances, to guide them quickly and efficiently to a place of safety.

Importantly, they will also enable the emergency services to work together more efficiently to help contain the incident so that damage and injury are kept to an absolute minimum.

The present move towards intelligent response systems is driven by technological advance in IT and communications. With the adoption of open standards, already well established in the building automation arena and gaining momentum in some sectors of the safety and security industry, the capacity for innovation is immense.

Prevent, Detect, Respond and Recover – The Virtuous Circle of Intelligent Response

Response coordination is indeed an important part of efficient preparedness. Again, technology exists that improves situational awareness and response efforts coordination – such as command and control systems – that combine both emergency and non-emergency systems onto one platform, controlled from a single point. With a clear and comprehensive overview of incident management, reporting and post-event analysis also becomes more seamless and efficient.

So the trend towards intelligent response systems will accelerate as technology progresses, since they enable many of the error-prone manual procedures to be eliminated through automated functionality. It is, however, important to remember that in the best incident preparedness and response plans, organisational, structural and technical measures operate in conjunction and are given equal attention. So intelligent response systems will also help re-establish the necessary balance between these three core components of emergency planning. APF

Markus Niederberger
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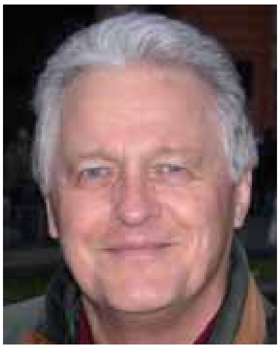

By Graham Collins

Monitoring Ahead

The use of monitors is becoming ever more sophisticated, as the latest thinking and offerings from the market leaders shows.

New Models Introduced

AKRON BRASS COMPANY has introduced several new monitor products over the past year. The Style 3430 GP Manual Monitor is claimed to be the smallest and most economical 3800 litres-a-minute monitor found worldwide. Manufactured from high strength Pyrolite, it includes a "T"-shaped control handle, integrated high performance stream shaper, and pressure gauge. It is available with either a 75mm ASA or DN80 inlet flange.

The Style 3462 Electric Forestry Monitor from Akron is the newest addition to the electric remote control monitor product line. This 300 1140 litres-a-minute monitor is the first monitor from Akron Brass to feature an integrated, on board control system. The completely sealed control system makes installation "a snap" by using engineered harnesses with IP67 rated connectors. The system communicates with the control components using the J1939 CAN communications protocol standard, which is widely used in the fire apparatus industry. Coupled with high speed motors and proportional speed joystick, the 3462 provides the precise stream control and a robust platform for wildland firefighting vehicles.

At the other end of the spectrum is the Style 3356 Trident High Flow Monitor. The Trident delivers up to 7600 litres-a-minute with a reach of over 90 metres down range. The Trident has 355 degree rotation and +70/–30 elevation range. This, says Akron, makes the Trident an excellent choice for the demanding aircraft rescue and fire fighting (ARFF) vehicle market.

The Trident platform can use standard Akromatic nozzles or integrated dual flow aspirated and

non-aspirated foam nozzles, and has what is described as an advanced feature set that includes oscillation with dynamic limit adjustments, one touch stow and deploy, and obstacle avoidance. It utilises the new Universal II control system to provide ease of installation with just two connectors needed. One connector is provided for the monitor and the other for the vehicle interface.

The Universal II control uses the industry standard J1939 CAN protocol to communicate with the peripheral control devices such as joysticks, direction indicators, and wireless controllers. It can provide up to five channels of motor control for the most demanding applications, and basic diagnostics codes directly to the user or advanced diagnostics and programming using the AkroView diagnostics software package.

The Style 3531 Oscillating Flange is the newest product in the industrial category. The 3531 can be used with various manual industrial monitor products to provide a wide protection range using only the water flowing through the device to execute the horizontal oscillation movement. It has been designed to protect some of the world's most valuable assets, and boasts a unique, maintenance-free polymer bearing design that eliminates the problems with traditional ball-bearing based devices in continuous use applications. The maximum sweep range of 165 degrees enables this unit to be used in hangar protection of aircraft. The 3531 is capable of flowing 4800 litres-a-minute at 250 psi (17bar) or 6000 litres-a-minute at 180 psi (12.5bar). It includes a speed control valve and a test port so that the unit can be setup and maintained without turning on full flow to the device.

For more information, go to www.akronbrass.com

Upgraded Offering

UNIFIRE AB of Sweden has recently upgraded and expanded its suite of electronic control systems for its popular Force series remote control, water/foam monitors for fixed firefighting applications.

Thanks to these latest developments of both electronic hardware and software, Unifire now claims to be capable of rapidly deploying powerful, customised, fully networked monitor systems that can work with almost any third-party, electronic peripheral device. These systems are individually designed to meet each client's functionality requirements.

According to Unifire's Director of International Sales & Marketing, Roger Barrett James: "Unifire constant development of the many advanced fire suppression systems we design for our clients has particularly been spurred by our clients' requests for semiautomatic and fully automatic fire detection and suppression systems, which combine our Force monitors and any of a variety of fire and flame detection technologies, valves, cameras, display screens and joysticks, With the introduction of our

latest developments in our suite of electronics hardware and software, we can now easily and quickly design and deploy fully networked firefighting systems that combine virtually any electronic device on the market, regardless of their communication protocol."

Unifire's networked systems are reckoned to offer a number of competitive advantages for fixed installations with multiple monitors. They are highly flexible and customisable, very quick to design and implement, and they are extraordinarily easy to troubleshoot, expand, service and upgrade. They use Unifire's off-the-shelf hardware and software, circumventing the time, expense and complications involved when utilising third-party control systems.

Among the hardware devices that make this possible is the Unifire Control System. This device is a PLC (programmable logic controller), which serves various functions in the network. The UCS allows for a large number of inputs and outputs, and it routs network communications. It also has a built-in display screen and a user interface, allowing technicians to troubleshoot, view system data and performance, adjust settings, and more.

The UCS units allow Unifire to create networks in many configurations to serve almost any function and layout desired. Programming all system functions is simple and straight forward. Adding and/or changing functions in a system is achieved simply by adding new nodes and/or updating system software. Unifire's systems can now, via off-the-shelf USB flash drives, accept software and even firmware upgrades. They can even record all network activity onto USB flash drives for instant analysis.

Some of the many applications include: automatic fire suppression systems, such as those comprising Force monitors, fire detectors, cameras, alarms, valves and remote controls; remote control systems in which multiple monitors are controlled from one or more control panels and/or radios; and more traditional installations of a single monitor that also requires the control of valves, lights, switches, monitors, and similar peripherals devices.

For more information, go to www.unifire.com

Models Suit All Needs

SILVANI firefighting monitors, claimed to be one of the world's largest ranges and configurations, are now distributed in Australia by Kidde Australia.

Models are available to suit the smallest to the largest of fire-fighting needs with models available to meet flows of between 1800 litres-a-minute and 60,000 litres-a-minute, and materials include carbon steel, stainless steel, bronze and light aluminium alloy. Hydraulic, electrical and hydro/electric remote control options are available on all Silvani monitors together with a wide range of single and multi-way control panels. Remote control panels for use in areas where explosive regulations apply are also available. A wide range of fog/jet nozzles, foam cannons and self-inducing nozzles and cannons is also available.

Silvani monitors are designed to optimise the performance of Angus Fire foams, also distributed in Australia by Kidde Australia, maximising throw and flow without reducing foam quality. Modern FP or AR-FFFP protein-based foams are preferred since they enhance the throw of the jet and minimise dropout and wastage. They also minimise fuel pick up from forceful plunging and provide superior burn-back resistance with longer post fire security.

For more information, go to www.kidde.com.au

Remote Controlled Future

According to TASK FORCE TIPS, the development of standards over the years has created some great recommendations for firefighter safety and survivability. Several recommend that "where possible" all steps be taken in the design of the apparatus to "reduce the need of the firefighter to climb on to or operate from the top of the apparatus". This includes the suggested use of powered equipment racks, bringing attack lines lower on the apparatus so they are easier to pull and repack, providing for the checking of apparatus fluid levels from ground level, and one item that especially catches the eye of anyone involved in fire streams management – the use of a remote controlled deluge monitor.

So, the question remains: is the day of the firefighter standing and using a deck gun from the top of the truck over?

It may be if current standards and workplace safety guidelines are adhered to. It also may be if fire suppression agencies see the continued need for this typically defensive tool, and rural agencies with water supply challenges understand the tactical capabilities it can provide. Additionally, acceptance of these apparatus components continues to grow as manufacturers such as Task Force Tips work to solve problems that have long plagued competitive legacy designs.

- Today reliability of electrical components (wiring, connectors, chip boards, and electrical interfaces) is excellent. Even in harsh fire ground conditions.
- Apparatus manufacturers continue to simplify installation procedures with support from TFT Service Team members who work hand in hand with installers.
- Electric motors and components are more dependable and have been "hardened" for the rugged environment.
- The size and weight of components continue to be reduced allowing for more elegant and efficient installations.
- Poor stream performance, excessive friction loss and internal stream turbulence that once plagued competitive models have now been eliminated with new computational fluid dynamics software programs.
- Field service and warranty issues are now managed effectively with 24-hour telephone and on-line technical service and support.

While there is still an expectation to see a mix of manual, as well as remote controlled, monitors on new apparatus deliveries, we also will find firefighters crawling across the top of trucks to use deck guns, pack hose, and retrieve equipment. So, what does the future hold? The answer is a mix of manual and remote controlled monitors being specified and installed and current remote controlled monitor producer continuing to improve designs, durability and performance. Fire departments with limited staffing that have chosen remote control monitors will also continue to specify the use of new lightweight portable monitors, such as TFT's Blitzfire and Crossfire, more and more for their heavy stream applications.

For more information, go to www.tft.com

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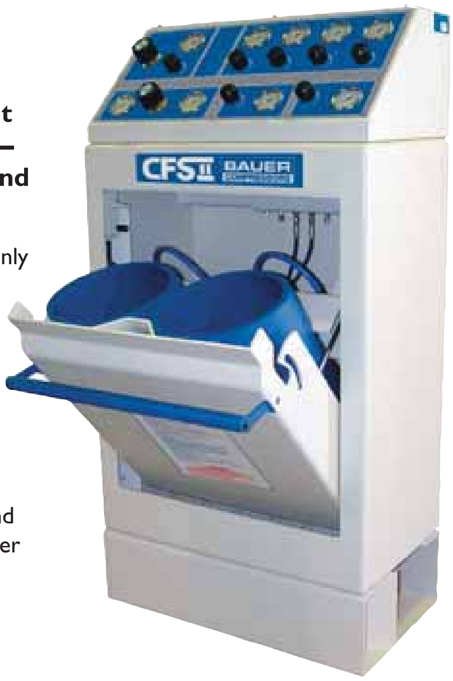

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All at Sea

Courtesy of US Coast Guard

Richard Storey

RSL Associates

The type of personal protection equipment required for marine and offshore applications is increasingly being designed to protect against the specific nature of the hazards most commonly encountered.

Marine firefighting is a general term used to describe activities to extinguish any types of fire, however caused, in a marine environment. For many years this meant dealing with fires on seagoing vessels, or more specifically, shipping. It was not until the 1930s that the first structures, other than ships, began to populate coastal and then deep water locations. In fact, the first structure to be erected on the sea bed out of sight of land was when the Ship Shoal Block 32 well drilled for oil exploration in 1947 off the Louisiana coast in the Gulf of Mexico. Since that time, fixed and floating platforms of many types, and for a variety of uses, have been located in the world's seas and oceans.

Regulatory Authorities

Current regulatory arrangements in the UK, and commonly in other areas of the world, reflect the changing face of marine hazards management. Marine firefighting has for almost a century been part of the wider issue of safety at sea which has resulted in the regulatory framework being conceived and developed by marine safety organisations. Those contributing to the regulations and safety standards that cover shipping are SOLAS (Safety of Lives at Sea), which issued its first fire safety regulations in 1974, IMO (International Maritime Organisation) and a variety of regional and national regulatory bodies. In Europe, the EU uses the MarED (Marine Equipment Directive), which encompasses a range of standards, to regulate marine firefighting activity, while in the USA this responsibility falls to the US Coast Guard (USCG). Elsewhere in the world, regulatory authorities include the Australian Maritime Safety Authority (AMSA), the China Classification Society and the Russian Maritime Register of Shipping.

However, in some countries, particularly in Europe, a split of responsibility exists between those organisations required to handle shipping and vessel related fires in rivers, docks and coastal waters above low water mark and the way such matters are handled in international waters. In the UK, the Maritime & Coastguard Agency (MCA) has a statutory duty for the initiation and coordination of civil maritime search and rescue. There is also an assumption that assistance will also be provided in coastal waters when possible. To this end the Maritime Incident Response Group (MIRG) was formed in 2006 which consists of 15 strategically located shore based fire and rescue services.

Out at sea, all aspects relating to safety on marine structures is the responsibility, in the UK, of the Health and Safety Executive. The relevant statutory provisions governing firefighting on UKCS offshore installations are the Offshore Installations (Prevention of Fire and Explosion, and Emergency Response) Regulations 1995, SI 1995 743, better known as the PFEER Regulations, together with the Approved Code of Practice and Guidance – ISBN 0 7176 1386 0.

The Regulatory authorities with responsibility for these matters in Australia and USA are NOPSA (National Offshore Petroleum Safety Agency) and BOEMRE (Bureau of Offshore Energy Management, Regulation and Enforcement), respectively.

Fire Hazards

At one time, marine fire risks were primarily associated with shipping and the vessels or their cargoes. The principal causes of fires at sea on vessels are accidents, collisions, mechanical failure in engines and cargoes catching fire. On passenger vessels, fires are the result of collisions, on-board accidents and mechanical failure. In the 21st century, the seas and oceans are increasingly becoming sites for static structures. Many of these are associated with oil, gas and other mineral exploration and harvesting in which mechanical processes, working in volatile environments, are required to bring gaseous or liquid hydrocarbons from beneath the sea bed to production platforms and then onto ships or into pipelines to bring them ashore for processing. Other structures, both fixed and floating, are also being erected at, or towed to, locations in many coastal waters around the world. These include offshore wind farms, tidal and wave power renewable energy installations, scientific research and monitoring stations as well as military and defence installations.

Clearly the range of fire hazards associated with these different activities varies widely and will depend considerably on the risks of accidents, combustibility of the materials used in structures, the types of cargoes carried in ships and the flammability of minerals being extracted on petrochemical production platforms in these marine environments. In some situations, firefighters will be able to work onboard, depending on the severity of the fire, but, following a blow out or explosion aboard an oil rig or gas production platform, fighting the ensuing fire may only be possible from firefighting vessels.

Also, the characteristics of the fires facing firefighters will reflect the volatility and flammability of the materials involved in the conflagration. Some materials burn much hotter than others. Some will throw off burning shards or molten materials, some can be unpredictable either due to the composition of the flammable materials involved (in particular hydrocarbons and chemicals) or prevailing weather conditions. Wind speed and direction can be particularly variable out at sea and can cause rapid changes in the levels of hazard experienced by firefighters.

Personal Protection to Suit the Conditions

As with land-based firefighting, the type of protection required is increasingly being designed to protect against the specific nature of the hazards most commonly encountered.

New marine firefighting standards introduced for use throughout Europe equate the hazards, if not the conditions, associated with typical shipping fires with those commonly experienced in structural fires. This has led to the new MarED standards, enshrined in EU Commission Directive 2010/68/EU, to adopt EN 469 (2005) as its benchmark for basic protective clothing for firefighting (A.1/3.3). This means that, throughout the EU, local fire and rescue authorities can deal with shipboard fires occurring in rivers, docks and coastal waters wearing their regular structural fire kit.

For parts of the world outside the EU, a new international standard has recently been developed and was published in June this year. The new standard, ISO 22488:2011 [Ships and marine technology – shipboard firefighters' outfits (protective clothing, gloves, boots and helmet)], has drawn substantially on the work undertaken for the recently issued European Standard.

Courtesy of Bristol Uniforms

Close proximity firefighting involving gas and oil fires, whether on production platforms or aboard ships, require protection from the intense heat and flames produced in such 'hot fires' and call for quite different types of protective garments. In the past, these have been typically manufactured using an aluminised fabric for the outershell which has the capacity to protect against intense flame lick and a reflective property to reduce the impact of radiant heat on the wearer. In some circumstances this type of firefighting will require PPE satisfying ISO 15538 (2001) – Protective clothing with a reflective outer surface (A.1/3.3).

New PPE Designs to Meet New Standards

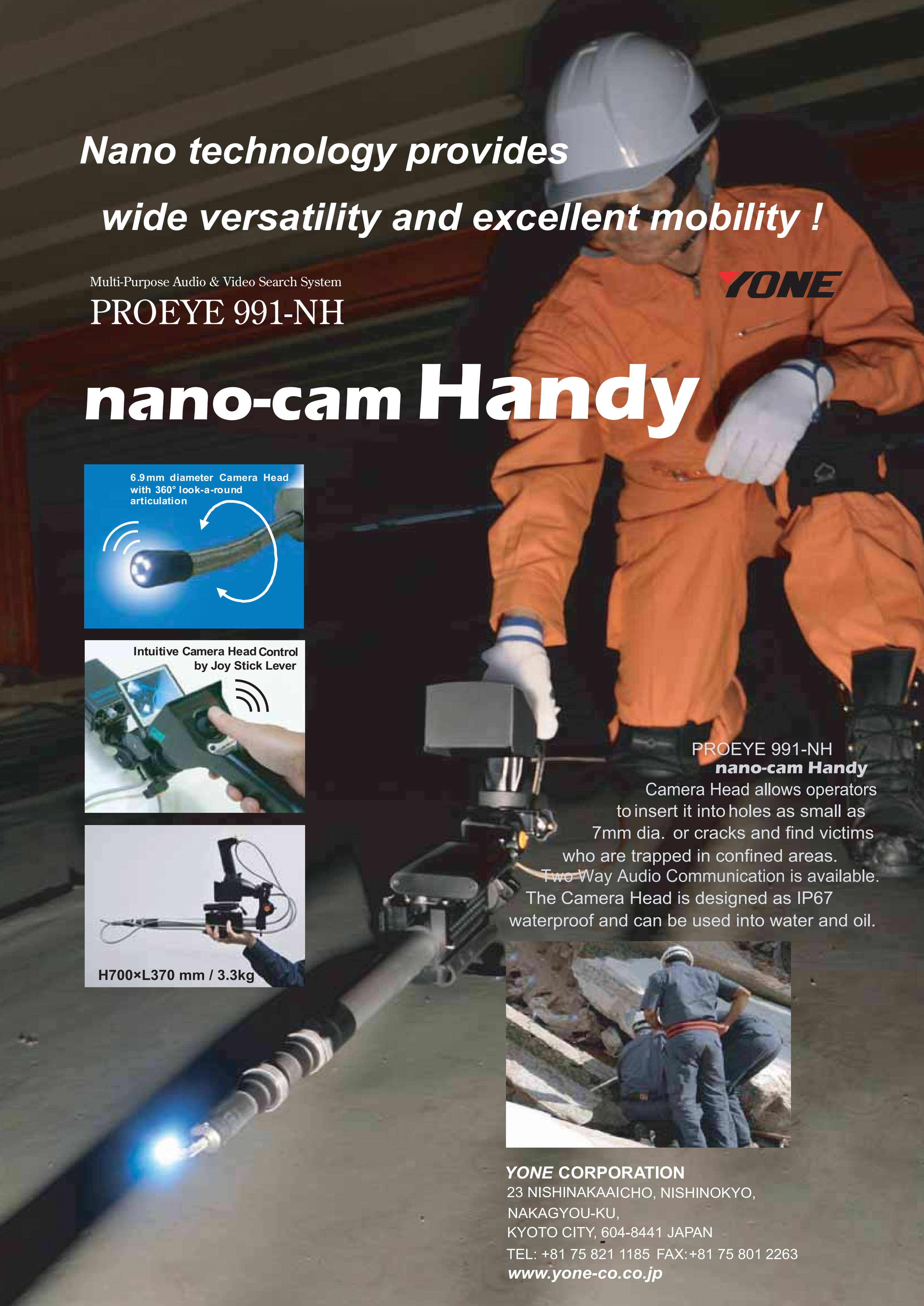
Marine firefighting garments have traditionally been designed to incorporate a yellow outerlayer to signify its use by emergency incident crews on board ships as well as other types of fires at sea. Frequently known as 'fleet suits', these garments are now made to provide the same protection as those used for structural firefighting on land. This means that garments meeting EN 469 (2005), as used by European municipal firefighters, can also be deployed by them when dealing with shipping fires on river estuaries, in ports and docks and in coastal waters.

For fighting fires involving shipping at sea, and for other marine fire emergencies, an alternative is the new design fleet suits which are being introduced to the market to coincide with the implementation of the new EU Commission Directive in December 2011. An example is the new Bristol Fleet Suit, an internationally recognised design with Wheelmark certification. This is available in 2 options meeting either EN 469 (2005) Level 1 or Level 2.

As with all PPE, compatibility is important and appropriately matched helmet, boots and gloves should be supplied. In Europe these should be to MarED approved standards, and include helmet to EN 443, gloves to EN 659 and boots to EN 15090 whilst the new international standard, ISO 22488:2011, when introduced, may be adopted in other parts of the world. APF

Richard Storey is Managing Consultant at RSL Associates

For further information, go to www.rslassociates.co.uk



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Structural Collapse Rescue – New Solutions for an Old Problem

Techniques for structural collapse rescues have been developing rapidly since the mid 20th century. Major drivers for change have been conflicts, major disasters and the technology of instant media coverage.

New hazards have seen new approaches to taming them. New equipment, increasingly developed specifically for rescue work rather than an opportunistic variation on existing tools, has transformed working practices. The concept of safety as a fundamental consideration has rightfully informed judgments on how to perform rescues and run operations.

To Rescue a Trapped Victim, First Find Them

Even in small scale collapses, the sight of piles of debris is a daunting one. Where do I start? Where is the person? Is there anyone here anyway?

The application of common sense, harnessing of evidence, interrogation of witnesses, having a methodical, structured plan, using all means of search at your disposal in the correct sequence will assist in the primary aims of urban search and rescue – finding and rescuing the victims.

Having a simple, pre-planned process that reduces risk and saves time is obviously a good thing. In structural collapse, variations on 'six stages of rescue' are commonly used. If this can be part of a teaching system that is able to benefit from best practice and feedback from around the world, so much the better. The training process for those involved in structural collapse can be an addition to the skill-set already held, for example, by firefighters, or for a specific role in disaster response. It should incorporate different levels of training, from an awareness level for everyone in the organisation, through the operator level, specialist trainers and management training too. When a whole new area of expertise is introduced to an organisation it is often those at management level who miss out on the process, leading to lack of understanding, antipathy and lack of efficiency.

The person in charge of the first attendance at a structural collapse has to deal with many pressures, not just those of managing the rescue resources, but also the expectations of relatives, other emergency services, and the public. It is very difficult to say: 'We are not going to risk our lives in this particular instance – we are going to put a number of safety measures in place, which may take a long time, before we commit ourselves to enter the collapsed structure.' Difficult, but it can be the right thing to say. What we need to do then is make sure that the reasons for the decision are explained to all the stakeholders.

Having found that there is a probability of there being a live, trapped person involved, we can narrow down the locations to be searched by the use of search management techniques such as asking where was the victim last seen, what were they doing, and where could they be expected to be at the time. Don not forget the basic one of calling their mobile phone and listening for the ringing – you might be lucky! The rescuers at a Glasgow, Scotland collapse knew they were getting close when they found the keys and phone of one of the victims.

If the area of search can be reduced to a minimum this means that we can concentrate our efforts and be time efficient. Time is the thing that we are really short of in these situations. This does not mean that we should be superficial with our search: it is just as important to have a high probability that there are no victims in a particular sector as it is to completely search the whole area. We can then confidently move on to the next sector to be searched. It may be acceptable that there is an 80 percent probability that the missing person is not in a patch of forest, but it needs to be pretty near 100 percent in a building. In instances of widespread, severely affected structures, such as happens in large earthquakes, there can be a desire, at least initially, to try and get to as many sites as possible in as short a time as possible. Having a system that identifies the most likely buildings and areas for victims to be in will help.

Among new developments in search tools are improved ground penetrating radar, new generation sound detection and location, and detectors for the substances humans emit such as carbon dioxide. These should result in the speedier location of live victims, but the reality is that you need to use all available high- and low-tech systems, so don not abandon the line-and-hail just because you have the mark 23 audio probe. And remember that search dogs can sometimes make mistakes and also have a lot of limitations (but do not tell the dog-handler that!)

The Victim has been Located – Now What?

Stabilising the structure may already have started. The use of shoring is absolutely essential in many cases, as it is very difficult to judge what an unstable structure is about to do next, and gravity has a tendency to keep right on working. It can be tempting to 'just have a quick look' but that is not the professional path. Listen to your instincts telling you that 'this is scary' and do something about it.

New shoring systems are becoming available that are stronger, more simple to use and more versatile than previous ones. We probably will not have enough of them. Even if we do, the ones we use may have to be left in place for a considerable time before we recover them (they may not even be recoverable) meaning that we have fewer for the next call. The fall-back position is timber. It is relatively cheap, versatile, and safe. The trouble is it can weaken in storage because of rot and insect attack; it can vary in quality (has a structural engineer checked your timber specification?) and it is bulky to transport. It also takes considerably longer to construct timber shores unless your crews are really well practiced.

The solution, of course, is to have both timber and commercial metal shores and a structured training regime.

Getting through the debris to reach the victim is the dirty bit. The availability of commercial, high capacity hydraulic demolition apparatus has certainly increased in some areas. The earthquake

in Christchurch, New Zealand saw particularly good examples of their use. Robotic demolition is also on the increase, but this is probably suited more to the recovery rather than the rescue phase of an operation due to the inherent 'lack of human' factor. It is also something to be flagged up in pre-planning: find out what is available and keep up to date. Most commercial demolition companies should be happy to make contacts with rescue professionals – after all they could get the contract to demolish afterwards.

Manufacturers that make commercial building and demolition equipment are increasingly bringing out versions of their kit with rescue in mind. These will incorporate, hopefully, things like a wider gap in handles to accommodate bulky gloves, dust suppression, extra carrying handles, higher visibility, and also a lower price tag . . . well, maybe not.

A big consideration, and one that rescue professionals should have considered, is the effect of exhaust emissions from gas powered machines. It is well know that you should not operate these in confined spaces, but next time you do some training in the open air put a gas detector near the equipment. The carbon monoxide levels given off by demolition saws can be horrendous. The exhaust gases can easily find their way into the debris pile. Victims may be able to endure a certain amount but you have to be aware of the potential problem.

Siting of generators and pumps should take this effect into account. Recent trends in emission reduction may make this somewhat less of a problem, and there are also products using battery and hydraulic power instead of gas. These, of course, bring their own limitations and safety issues, but battery technology developments are particularly interesting at the moment.

Access systems have developed considerably in the last 20 or so years. Safety considerations have always been a driver of change. Standards are now being laid down which it would be difficult to justify falling below. The area is more regulated than ever before. Working at height has always been a dilemma when on collapsed structures – you don't really want to be anchored to an unstable wall, for example. The natures of the tasks are such that it will almost invariably be a solution involving personal, rather than collective, protection methods. Recent developments are tending towards simplified, one-bag type solutions, which need less technical know-how on the part of the operator and increased speed of deployment.

Personal protective equipment is also an area that is constantly evolving, with the demand being for better protection, more durable, lighter, warmer or cooler equipment. The integration of several types of protection (for example dust, eye, head and ear) is not solved yet, especially if you use products from different suppliers. Add in factors like operating in contaminated environments and the subject becomes extremely complicated. A useful report on PPE standards, especially relating to exposure to chemical, biological and other nasty environments, is at http://www.communities.gov.uk/documents/fire/pdf/1779289.pdf

Communications is an area where there is criticism in almost all debriefs. The demand is for systems that are, above all, reliable. They also have to be robust and capable of operation in severe conditions. This subject does not all need to be about the hardware, though. Site marking is about communication; the use of standard symbols and layouts can act like signal flags on a ship. You do not have to speak the same language. Good communications results in more efficient searches – the same areas do not get searched more than they have to if you can hand over accurate details of the previous team's work.

It was stated at the beginning that techniques and equipment are developing rapidly. Perhaps more significant is the increase in resources, particularly specialist rescue teams, being seen around the world. In many cases these can be integrated with existing services, building on the experience of many years of fire service operations, for example. Whether this is possible or not, it is important to source equipment and training from organisations that have the experience and knowledge to provide the quality required for such a critical task.

Still on the integration theme, it is possible (and cost effective) to procure equipment that is multi-functional, so that it is not only of use in structural collapse but also, for example, road traffic incidents, using hydraulic rams that link to shoring struts, having airbags that can be used for lifting vehicles, stabilising trenches, and so on.

In some ways the organisations that are just about to embark on setting up a structural collapse capability are lucky. They can draw on the expertise of those who have done it already and compare the different approaches. They are not constrained to procure more of the same equipment solely on the grounds of compatibility, but are able to judge what is the best, most effective kit on the market today and get what they really need and deserve. APF

Alistair Swift is a heavy rescue trainer with NATEL Heavy Rescue and Emergency Lifting

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Incident Command in Industrial Settings

Garry Eglinton

ERGT Australia

Incident Command in industrial settings is beginning to emerge as a distinct research topic for training specialists interested in selection, training, decision making, stress management, leadership and teams working in critical situations. While there have been significant advances in the area of training programs, the use of specially designed simulators for incident commander training consistently demonstrates superior depth, quality and consistent outcomes from individuals particularly when assessed against industry competency standards.

Within the Australian offshore oil and gas industry there are a large number of people working and supporting operations involving fixed and mobile facilities that exist many kilometres off the Australian coastline. While the companies contribute to the training and competency of their permanent workforce, a large gap in the level of understanding and knowledge of the requirements to manage emergency incidents occurring in the offshore sector had been identified. More importantly the capability to deliver this type of training in the workplace was a significant impediment in terms of time and expertise required (APPEA 2005).

The remote offshore workplaces have minimum facilities for instruction or workplace assessment and rely upon the demonstration of competencies on simulated workplaces constructed around defined command and control processes. The Australian Petroleum Production and Exploration Association (APPEA) identified this need in 2002 and have looked to Registered Training Organisations (RTO's) for programs to be developed for the offshore oil and gas industry. These programs are aimed at equipping offshore incident commanders with the requirements to manage major emergencies on remote offshore facilities (APPEA 2005).

The most effective process identified by industry to develop the appropriate knowledge and cognitive skills, was through simulated exercises and scenarios that focused on the underpinning knowledge and skills of managing significant emergencies in a complex high-risk environment. Without this range of knowledge and skills there was a risk to both the individual, the workforce and significant potential for loss of life, in an environment that carried a high level of inherent risk. This has been demonstrated by incidents such as the Piper Alpha disaster in 1988, and more recently the Deepwater Horizon incident in 2010, both seminal incidents for the offshore oil and gas industry.

Figure 1

Knowledge Dimension	The Cognitive Process Dimension					
	Remember	Understand	Apply	Analyse	Evaluate	Create
Factual Knowledge	Recognition of terminology used offshore	Classifying incidents against scenarios	Using information during simulations e.g. communications	Structuring information according to terminology and plans	Monitoring the use of specific terms or technical vocabulary	Generating lists of acronyms or organisation charts
Conceptual Knowledge	Knowledge of Incident management theory e.g. ICS, NIMS, AIIMS, CIMS.	Mapping, comparing various facilities and risks	Implementing theory based responses in scenarios and monitoring response	Discriminating good performance from not yet competent in application of models	Critique performances according to basic IM principles	Design scenarios that demonstrate specific principles in the response
Procedural Knowledge	Recall specific procedures for managing defined events e.g. oil spill	Summarise standard operating procedures used offshore	Implement response or management procedures to assist in exercises	Analyse skills in applying procedural responses during scenarios	Critique application of procedures for defined events	Design, prepare or produce new procedures for use in offshore incidents
Meta cognitive Knowledge	Recall strategies and conditions for incident management defined in relevant texts	Infer context and conditions across a range of different facilities e.g. platforms, FPSO's, rigs	Implement tasks and review responses dependant on the difficulty of the tasks	Consider personal strengths and weaknesses in theoretical knowledge of emergencies in offshore facilities	Critique responses and conduct post exercise reviews with teams	Develop hypotheses concerning incident response and emergency management to support the development of effective scenarios

G.K.Eglinton 2005

Incident command in high risk facilities requires elevated levels of knowledge and cognitive conceptualisations of thinking processes. Anderson and Krathwohl and Blooms Taxonomy of Educational objectives identified a number of knowledge types for effective practice would be in the knowledge, cognitive and affective domains.

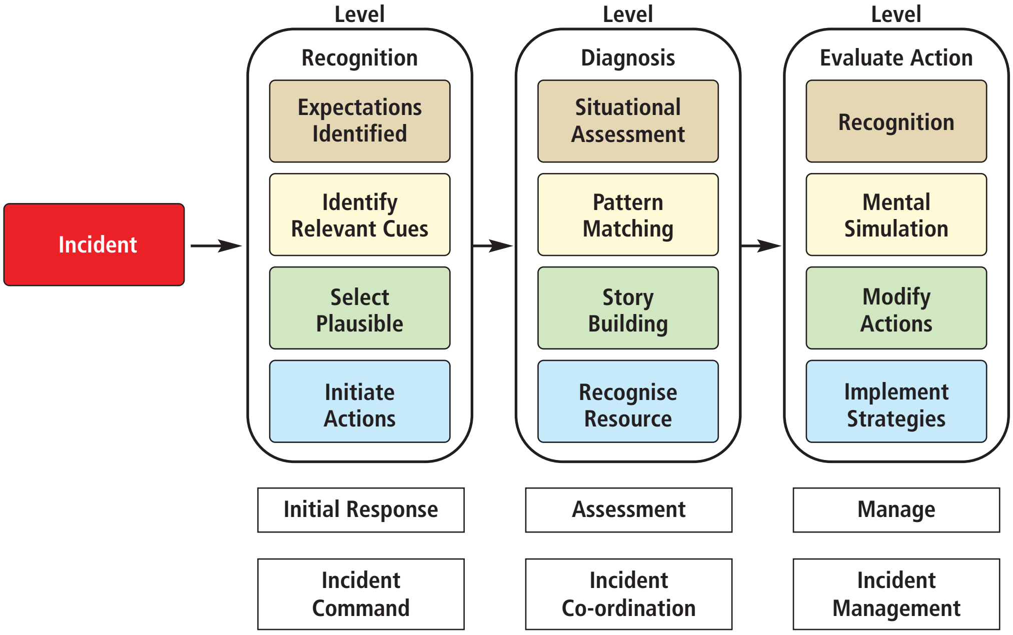
Figure 1 looks at these requirements in terms of knowledge or cognitive processes described by Anderson and Kathwohl and adapted for offshore oil and gas Incident Commanders.

Decision Making

Despite the requirements of high-speed decision making during critical incidents in high risk industries, it is only recently that research psychologists have begun to investigate incident command decision making in demanding, time-pressured situations.

A review of standard psychological literature on decision-making often fails to adequately describe emergency decision making, as so much of it is based on undergraduates performing trivial tasks in laboratories. Upton also indicated that

Figure 2: RPDM Model applied to Industry Incident Management (after Klein)



management research was often concerned with individuals making strategic decisions when they have several hours or days to think about the options, carefully evaluating each one in turn against their business objectives using decision analysis methods. In considering the type of critical decision making required in industrial settings during incidents it would seem apparent that there is a need to examine this more closely.

Naturalistic Decision Making (NDM)

There has been significant interest by applied psychologists (Klein) into naturalistic decision making (NDM), which takes place in complex real world settings such as incident command. This research may hold significance for developing training processes and practices for nascent commanders and their teams to make decisions controlling an incident in industrial settings. Research has identified processes used by expert commanders when making operational decisions in emergencies.

Ten factors that characterise decision making in naturalistic settings are:

1. Ill-defined goals and ill-structured tasks.
2. Uncertainty, ambiguity and missing data.
3. Shifting and competing goals.
4. Dynamic and continually changing conditions.
5. Action feedback loops (real-time reactions to changed conditions).
6. Time stress.
7. High Stakes.
8. Multiple players (team factors).
9. Organisational goals and norms.
10. Experienced decision makers.

In typical workplace environments, when an incident occurs, information may come from many sources on the site. It is often incomplete, can be ambiguous, and is prone to rapid change. In an emergency, the incident commander and his or her team are working in a high stress, high risk, time pressured setting and the lives of those affected by the emergency, (including their own rescue personnel) may be dependent on their decisions.

Recognition-Primed Decision Making (RPD)

Klein's approach stemmed from his dissatisfaction with the applicability of traditional models of decision making to real life situations, particularly when the decisions could be lifesaving. The focus was on operational environments where experienced decision makers had to determine a course of action under conditions of high stakes, time pressures, dynamic settings, uncertainty, ambiguous information and multiple players.

Klein's research began with a study of urban fire ground commanders who he saw acting and reacting on the basis of prior experience; generating, monitoring, and modifying plans to meet the needs of the situations. It appeared that these incident commanders were assessing and classifying the situation in front of them. Once they recognised that they were dealing with a particular type of event, they usually also knew the typical response to tackle it.

The fire ground commanders would then quickly evaluate the feasibility of that course of action, imagining how they would implement it, to check whether anything important might go wrong. If they envisaged any problems, then the plan might be modified but only if they rejected it, would they consider another strategy. This describes how experienced decision makers can rapidly decide on the appropriate course of action in a high-pressure situation.

The RPDM model has evolved into three basic formats. The following diagram provides an adaption of Klein's basic model into an industrial application for incident command, co-ordination and crisis management. This begins with a simple feature match where the decision maker thinks of several interpretations of the situation and uses key features to determine which interpretation provides the best match with the available cues.

The key features of Klein's RPDM model are as follows:

- Focus on situation assessment.
- Aim is to satisfy not optimise.
- For experienced decision makers, first option is usually workable.

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Figure 3

Creative The most sophisticated (and resource intensive) is creative problem solving which requires a diagnosis of an unfamiliar situation and the creation of a novel course of action. This is the most demanding of the four techniques, requires significant expertise and as Kersholt (1997) found, is more likely to be used in a planning phase rather than during an actual operation.	**Procedural** In fast moving, high-risk situations these styles are difficult if not impossible to use, and in order to maintain command and control, officers have to rely on procedural or intuitive styles which will produce a satisfactory, if not an optimal decision. Procedural methods involve the identification of the problem faced and the retrieval from memory of the rule or taught method for dealing with this particular situation. Such decision methods (e.g. mental models) are frequently practised in training.
Analytical This requires a full situation assessment, rigorous information search and then recall, critical comparison and assessment of alternative courses of action. Again with proper preparation, some of these option choices may already have been evaluated during exercises or incident response planning.	**Intuitive** With experience, officers may also use the fastest style of decision making, intuitive or recognition-primed decision making described above. In this case there may not be a written rule or procedure but the commander rapidly recognises the type of situation and immediately recalls an appropriate course of action, on the basis of prior experience.

- Serial generation and evaluation of options (action plans).
- Check action plan will work using mental simulation.
- Focus on elaborating and improving action plan.
- Decision maker is primed to act.

At present this appears to be one of the best models available to apply to critical incidents, whether the environment is onshore or offshore; aviation, major industrial, or medivac situations.

Command Roles and Decision Style

NASA researchers (Orasanu) found that two key factors for the initial situation assessment are judgements of time and risk and that these may determine the appropriate decision strategy to use. From studies of commanders' decision strategies these techniques are briefly outlined above in terms of the decision skills required. Orasanu indicated there were four main styles of decision making used by commanders: creative, analytical, procedural and intuitive (Figure 3).

These are the most powerful decision techniques as they operate on managing information sets, but consequently they require far greater cognitive processing. Thus, they take a period of time to accomplish, and for most individuals may only be used in specific situations.

Conducting Simulator Based Training

The training implications of applying this new decision research to incident command in industrial settings is first to determine the types of situations incident commanders will use different types of decision making. In these situations the critical focus will be on situation assessment. So the next stage is to discover the cues these experts use when quickly sizing up an incident and the responses they would choose to apply once they have assessed the situation.

The key to incident commander training for industrial settings, whether done at site or in a purpose built simulator, is that they provide incident commanders with repetitive practice in visualising a tactical situation, describing that visualisation, deciding on a course of action, and directing team members toward controlling the incident. The fact that they must brief their solution in the form of orders to their team members provides practice in exercising facets of incident command. The recurring application of the mental skills needed to solve tactical problems helps to develop the ability to make sound, timely decisions and to issue clear, concise orders.

Exercises in a simulator that present a true representation of their particular plant or facility will provide the opportunity for command team members to gain insight into how the incident commanders think. By describing tactical problems and allowing the incident commander to practice describing their vision and expressing their intent to the team members helps to turn their vision and intent into action. The exercises also afford team members, such as the incident co-ordinator or communications officer, the unique opportunity to perceive the incident commanders insight and understand their thought process when they all participate in a particular exercise.

When the incident commander explains the situation and plans to the group during "time outs", the other members gain a better appreciation of the problem. The feedback and comments from the other participants can provide the incident commander with the insight with which to solve the tactical problem better next time. This creates a shared situational awareness that will support understanding.

Incident commanders strengthen their ability to make sound decisions quickly by repeatedly practicing visualising a situation, describing that visualisation to others, and directing team members through orders and instructions. Regularly conducting such training develops an individual's ability to assess the situation using simple but effective tools such as the summary, potential, plan, task methodology.

One organisation that has used simulation training for disaster preparedness is ERGT Australia. ERGT has used a simulator to prepare incident commanders and emergency teams for multiple types of offshore incidents for many years. The program and the simulator were developed based on Australian and international competency standards for incident command training. The fully programmable control room simulator is the first in a series of simulations to address process control in abnormal situations, explosions, fires and

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For further information, go to www.ergt.com.au other disasters that high risk industries must prepare for.

Developed by a team from ERGT, the simulator allows learners to practice their emergency skills in a safe, controlled environment to train for situations such as fire fighting, oil or chemical spill response, hazardous material handling, and response to critical incidents. One feature of simulation systems is the implementation of a "dynamic run-time clock," which allows simulations to run a 'simulated' time frame, 'speeding up' or 'slowing down' time as desired. Additionally, the system allows session recordings, picture-icon based navigation, file storage of individual simulations, multimedia components, and the launching external applications.

Instructionally, the benefits of emergency training through simulations allows for the learner's performance to be tracked through the system. This allows the simulator operators to make adjustments as necessary or alert the facilitators to topics that may require additional attention. ERGT's incident command simulators allow for immediate feedback, formative and summative assessment of performance and allow the learner to engage in the learning topic again and again.

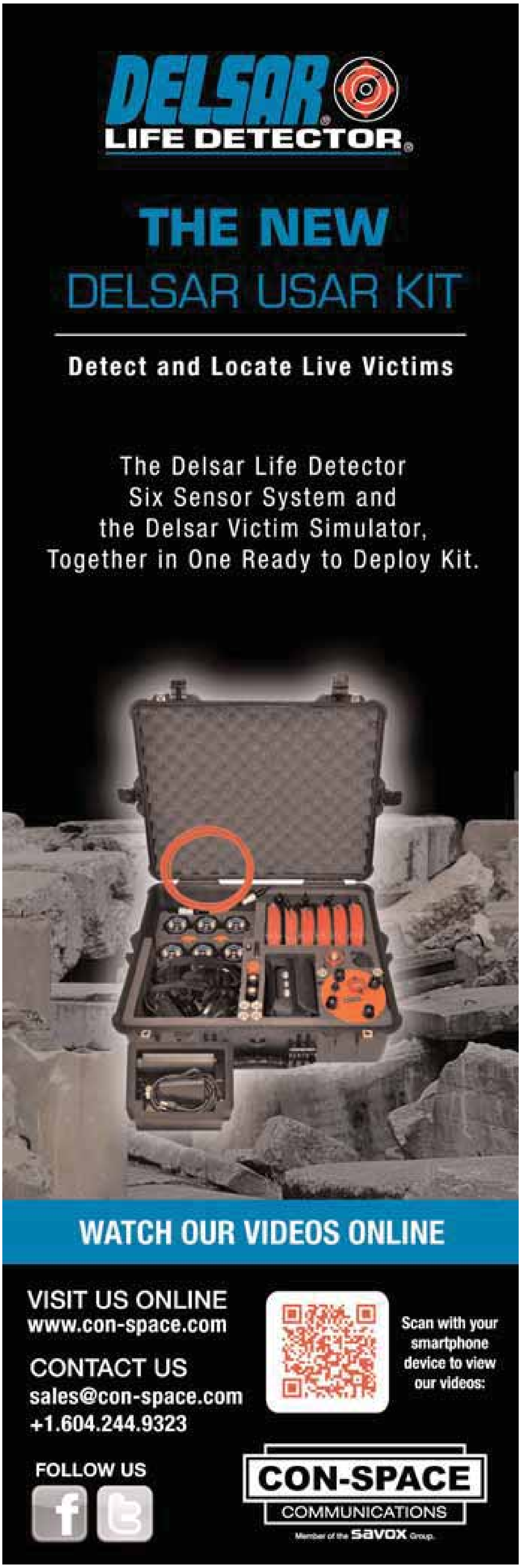
What ERGT has observed in some trainee incident commanders who operate under pressure is reduced concentration, narrowing of perception, fixation, and inability to perceive simultaneous problems, distraction, and difficulty in prioritising and distorted time perception. Klein points out that these effects are most typical when analytical decision strategies are used. In contrast, the recognition-primed type of decision strategy employed by experts under pressure may actually be reasonably stress proof.

Finally the incident commander does not, and should not work alone. The need for effective team performance in the command room remains paramount. Recent advances in team training, known as crew resource management (CRM) have been developed by the aviation industry and are now used in medicine and the energy industry. The focus is on non-technical skills relevant to incident command, such as leadership, situation awareness, decision-making, team climate and communication.

Conclusion

The approach to simulation training for incident commanders follows the modelling described by Cohen regarding developing training for critical decision making. Cohen describes the training as unlike many other approaches, it is not based exclusively on formal models of how people ought to think, but on observed differences in decision making strategies between more and less experienced decision makers.

Cohen concludes that instruction does not present a set of abstract, disembodied thinking strategies, but trains the targeted skills in a concrete way, embedded within the specific decision making domain and that training does not simply focus on the individual, but includes an emphasis on decision making within a group context, in which communication is often imperfect or impossible. This describes both the environment and the requirements for developing effective incident commanders in industrial settings. **APF**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Tales of Risk and Heroism

Risk management practices cannot be fully effective when they are solely preoccupied with procedures, while ignoring the risk taking nature of the individuals involved.

Naturally enough, King Stefan and Queen Leah were horrified when the baby Princess Aurora (alias 'Sleeping Beauty'), was cursed by Maleficent. On her 16th birthday, Aurora would die after pricking her finger on a spinning wheel spindle, what should they do? Clearly the ideal solution might have been to deal with Maleficent and her like and put an end to cursing all together. However, since Maleficent had the powers of a wicked witch, we have to excuse Stefan for opting for the regulatory route and for dealing with the threatening object rather than with the complexities and uncertainties of the individual. All spinning wheels in the kingdom were duly burned!

In the real world we face risks of all kinds that we would like to mitigate, but here is the dilemma; like the fabled spinning wheel, every day objects like iron frying pans, pointy sticks and even a frozen leg of lamb (according to Roald Dahl) are all potentially dangerous or even deadly weapons. Whether or not there is actually any risk involved depends entirely on whose hands these potential weapons are in.

The question is whether, in our management of health and safety, we may increasingly be trying to pursue opposing and incompatible objectives within the emergency services and in relation to public expectations?

The trends and outcomes in modern risk management appear surprisingly similar to those in Sleeping Beauty. In attempting to eliminate risk, the human factor is left languishing in the 'too difficult basket', becoming marginalised by a preference for procedural solutions; rulebooks, checklists, regulation of all kinds and a labyrinth of legislation. This is not of course because human factors are daunting in the Maleficent sense, but they are daunting in their complexity and their obscurity. We have been at a loss to know how to get to grips with the human risk factors, but recent research into personality and Risk Type is making an important contribution.

Financial events provide their own modern morality tale as the total failure of all safeguards against excessive risk lead to the near disintegration of the world economy. Terms like 'toxic debt', 'rogue banker' and 'Frankenstein bonds' have made it from the financial and business pages into the tabloids and into our daily lives. Risk taking is, of course, at the very core of the problem. However, even though the perpetrators of financial chaos are easily identifiable, we don't tend to ask 'what is it about these people that allowed them to do it?' 'What human chemistry was responsible for such delusions of indestructibility?' 'How did the once staid and sober bankers turn into greed driven Geckos of Wall Street?'

And what is going on in the emergency services?

Angry headlines following the 2005 London bombings highlighted the delay in firefighters reaching the trapped and dying victims deep underground, leaving shocked and wounded passengers to help each other. In 2007, an inquest heard how police community support officers stood by while a ten-year-old boy drowned in a pond in Wigan in the UK. Senior officers with the Greater Manchester force, which employed them, said they acted "correctly", citing health and safety restrictions by way of explanation.

In another incident a volunteer coast guard saved the life of a 13 year old who had fallen onto a cliff ledge in gale force winds. In spite of his courage and initiative he was criticised for breeching Health and Safety regulations and 'under immense pressure' resigned his post. And, more recently, a 51-year-old village post woman of 21 years service was suspended from duty after clinging to the bonnet of her van in a 'courageous' bid to stop a thief driving off with the mail. She has been threatened with the sack.

Meanwhile, the UK public has been as prominent as ever on the front line. One headline reads, "Hero students leap into river to save drowning woman as police officers refuse to help". Check out too the extraordinary and unforgettable YouTube video clip of pensioner Ann Timson (dubbed Supernan) tackling six armed raiders with her swinging handbag and driving them off empty handed.

Of course, these accounts of over cautious emergency services, of heroes facing dismissal and of the general public taking on the criminals all have the same underlying theme; the spontaneous impulse of people to come to the assistance of others in peril with absolute conviction and without concern for their own safety. Many others, of course, would have cowered or run for it – but that is the simple reality about the diversity of responses to risk across the spectrum of human nature.

The contrast between have-a-go members of the public and the procedural approach of emergency services looks like a fundamental disconnect in the fabric of modern life. Both heroism and Health and Safety are concerned with the protection or rescue of those under threat or in distress. The question raised by the above examples is whether, in our management of health and safety, we may increasingly be trying to pursue opposing and incompatible objectives within the emergency services and in relation to public expectations? In short, is the Health and Safety approach being taken to counterproductive extremes? Some clearly believe it is.

In the children's story 'Wendle's Workshop', an ingenious mouse invents robots and much else. The Wendlebot was designed to tidy the workshop, which it does very effectively, but then it cannot be stopped. By the time it is finally destroyed it has reduced everything in sight to tidy piles of powder or useless fragments. It then sets out to tidy the world. Maybe Health and Safety has become a Wendlebot? Having carried out its initial task very well, but now out of control, it persists to create a topsy-turvy world, preoccupied with form filling, box ticking and paralysing risk analysis? Apparently, the present UK government is concerned. Lord North has been overseeing a review of Health and Safety regulations and the UK Prime Minister recently pledged to free emergency services from senseless heath and safety rules.

King Stefan and Queen Leah failed to stop the witch, the emergency services procedures do not stop people being heroic (just parts of the emergency services) and the FSA regulation of the finance sector did not prevent the excesses of the financial meltdown. Human factor risk is a challenge and is hard to get to grips with, but total reliance on procedures and regulations simply doesn't cut it. Heroes will be heroes, chancers will be chancers and the anxious will be fearful. Managers have to manage and leaders have to lead and that means making judgements and decisions and not abdicating that responsibility or hiding behind a fog of spuriously systematic or numeric procedures. Solutions have to work from honourable principles and personal responsibilities. Managers need to know their people, their strengths and their limitations and to train, support and deploy them appropriately.

If this all this sounds rather one sided, there clearly is an important place for the regulatory approach. If there is a problem with current practices, it is that regulation has become too influential and an easy way of avoiding real issues about individual differences. The truth about risk is that individuals really are fundamentally different in their propensity for risk. They differ in their Risk Type, in their risk attitudes in their risk tolerance and in the degree to which they expose others to risk. These differences are the problem, in so far as the impulsive, the carefree, the adventurous all push the limits in terms of the risks they are inclined to take and the risks they expose others to, but they are also part of the solution. Any enterprise needs risk takers. They drive business and they drive the economy as well as pushing the frontiers in the arts, sciences and technology. Creativity, entrepreneurism and heroism, all involve taking risks – indeed any investment of time, effort or money involves risk. Risk is as ubiquitous as the air we breathe.

The challenge for managers must be to deploy risk types appropriately, to achieve the appropriate balance of risk types within any group, at the level of the team, the department or the organisation. This has been difficult to achieve because the human risk landscape has been virtually invisible. Look across the room, or out of the window, or across the crowded rush hour train carriage; there is a lot to take in terms of individual differences, but zero information about their disposition towards risk. Some will undoubtedly be crazy hot-heads; up for any kind of wacky adventure, others will be so risk averse that they are permanently anxious and fearful and will worry and fret themselves through their working day. These fundamental differences in temperament need to be recognised and harnessed.

Personality research reveals eight Risk Types; types whose underlying temperament establishes a persistent bias towards very different perceptions, expectations and behavioural responses. This kind of analysis has the potential to make the human risk landscape visible; to provide a vocabulary that facilitates planning, research and discussion about human factor risk. These are important steps in getting to grips with human factor risk and towards redressing the balance with the regulatory approach.

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In the Sleeping Beauty story, the regulatory strategy; the banning of all spinning wheels, fails to save the heroine but the effects of the curse are moderated by Merryweather, the good fairy, who was able to influence the impact of the wicked witch Maleficent, for our purposes, the personification of human factor risk. Recent and current world events dramatically highlight the potency and potential destructiveness of risk mismanagement. To achieve a Merryweatherian moderating effect, we need to understand and address the human risk factor. A greater understanding of the roots of risk-taking in the temperament of the individual must be of central importance. To succeed we need the capability of making more strategic management decisions about who we rely on for what, which combinations of risk types is optimal for any circumstance and where throughout the organisation the various risk types are currently positioned.

Type Definitions

- **Spontaneous**
  Uninhibited and excitable, this Risk Type enjoys the spontaneity of unplanned decisions. They are attracted to risk like moths to a flame, but are distraught when things go wrong. Their passion and imprudence make them exciting but unpredictable.
- **Intense**
  The Intense Type tends to be highly strung, pessimistic and nervous about any threat to their equilibrium. In extreme examples, personal relationships and decision-making can become an emotional minefield. Passionate and self-critical by nature, they react strongly to disappointment, taking it personally when things don't work out.
- **Wary**
  Self-disciplined and cautious of risk, the Wary Type is organised but unadventurous and puts security at the top of the agenda. They will be drawn to the idea of securing their future but anxious that however well something worked for others, in their case it will go wrong.
- **Prudent**
  Very self-controlled and detailed in their planning, the Prudent Type is organised, systematic, conservative and conforming. Conventional in their approach, they prefer continuity to variety and are most comfortable sticking to what they know.
- **Deliberate**
  Self-confident, systematic and compliant, the Deliberate Type tends to be unusually calm and optimistic. They experience little anxiety and tackle risk and uncertainty in a business-like and unemotional way. They never walk into anything unprepared.
- **Composed**
  The Composed Type is cool headed, calm and optimistic, but at the extreme may seem almost oblivious to risk and unaware of its effect on others. They take everything confidently in their stride, seem quite imperturbable and manage stress well.
- **Adventurous**
  The Adventurous Type is both impulsive and fearless. At the extreme, they combine a deeply constitutional calmness with high impulsivity and a willingness to challenge tradition and convention. Intrepid and never discouraged, they quickly rebound from any setback.
- **Carefree**
  Spontaneous and unconventional, the Carefree Type is daring, excitement seeking and sometimes reckless. Not good at detail or careful preparation, they often seem unclear about their objectives. Their impatience and imprudence can lead to hasty and unwise decisions.
- **Typical**
  Individuals who show none of the extremes that characterise other Risk Types are classified as 'Typical'. Because they score close to the centre they will not naturally be exceptionally prudent or unusually reckless, neither will they be particularly emotional or extremely calm. Any pronounced risk-taking behaviours will likely be due to attitudes developed from specific experiences. **APF**

Take the Survey – Discover Your Own Risk Type

Asia Pacific Fire would like to invite you to find out about your personal attitude to risk.

How to take part:

1 Go to http://www.psy-key.com
2 Choose 'Online Assessments'
3 Enter access code: "firefighter"
4 Follow the on-screen instructions

You will receive a detailed report about your risk type, your risk attitude and your risk tolerance.

Geoff Trickey is Managing Director of Psychological Consultancy Ltd

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40/747 1st Fl Moo 10 Nuanjan R, Khet Buengkum
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Tel: 66-2-946-1593-98 Email: sp@sp-associates.co.th
Dealer/Distributor

SEA AIR THAI CO LTD
98 Soi Ramintra 49, Bangkok
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Tel: 668-7900-0783 Email: craskin@gmail.com
Website: www.seaairthai.com
Dealer/Distributor

VIETNAM

APTES VIETNAM, JSC
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Website: www.aptes.com.vn
Dealer/Distributor

LACVIET TECHNICAL SCIENTIFITIC & ELECTRIC CO LTD
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Contact: Nguyen, Tuan
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Website: www.lacviettech.com.vn
Dealer/Distributor

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Website: www.ancom.cn/www.cuttersedge.com
Dealer/Distributor

NORLAN ENTERPRISES INC
Room 952, #218 Tang Li Road, China
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Website: www.norlan.cn/www.cuttersedge.com
Dealer/Distributor

WUXI NEW FIRETRE SAFETECH LTD
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Website: www.alarmsupply.com.sg
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THAILAND

SIL TECHNOLOGY CO LTD

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Dealer/Distributor

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MARS SYNDICATE

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Mr. Akm Rasid Hassan Technical
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CHINA

I-SAFE FIRE EQUIPMENT (TIANJIN) LTD

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Yeongdeungpo-Gu, Seoul Korea
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Tel: (82-2)-2668 5911 Fax: (82-2)-2668 5914
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10th Anniversary Edition

2001-2011

Issue 40 – December 2011

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ASIA PACIFIC FIRE MAGAZINE

REPORTING TO THE ASIA PACIFIC FIRE PROTECTION AND FIRE SERVICE INDUSTRY

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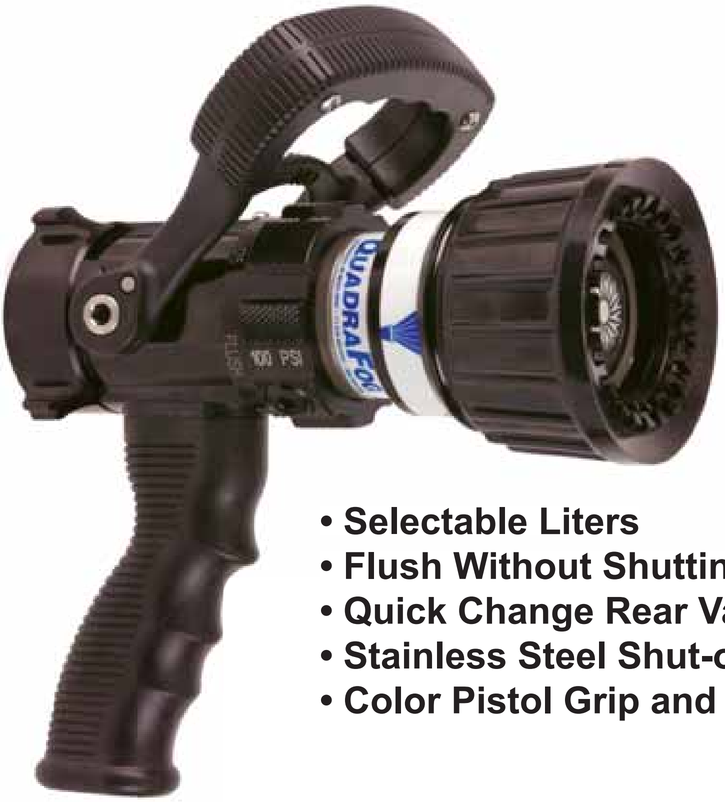

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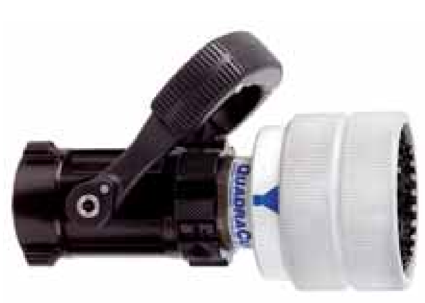

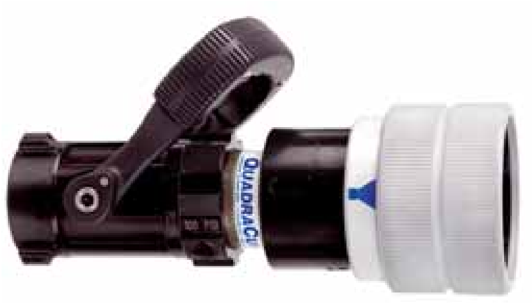

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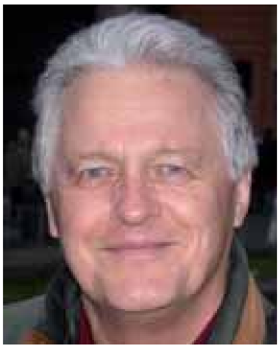

Ten Years on, and we are still Defying Nature

By Graham Collins

This is something of a landmark edition of Asia Pacific Fire as it marks the magazine's tenth birthday.

While optimists would argue that it is therefore a time to look to the future, it is difficult not to look back, particularly as we live in a part of the world where fire and rescue personnel have to live and work in the constant shadow of potential disaster. In the past year alone we have had earthquakes in New Zealand that still rumble and threaten the lives of Christchurch residents and workers, and Japan still struggles to wrench itself back to some semblance of normality following the earthquake and tsunami that resulted in an horrendous nuclear disaster and radiation levels that left a terrible loss of life in its wake. Queensland suffered floods and cyclones. More recently, the flooding in central and northern Thailand killed hundreds of people and damaged millions of homes and livelihoods.

Coincidentally, I recently spent a few days in Melbourne and while I was there, I visited the very impressive Immigration Museum (being a recent immigrant myself) and was immediately struck by the high percentage of the immigrants that have come to Australia to escape natural disasters or their aftermath in their homelands. The aging sepia photographs underpinned just how widespread and devastating many of these natural disasters were. It also brought into sharp focus how better prepared we are today to contend with them.

Of course, when I say "we", I have to acknowledge that there is a huge disparity of preparedness and resources across the Asia Pacific region, and "unfair" is the only word that springs to mind when, as so frequently seems to happen, natural disasters are rained upon the poorest, most unprepared and least equipped people. I am though sure that it raises – if only in a small way – the spirits of those affected when fire and rescue personnel from across the world do not hesitate to risk their lives to go to their aid.

These volunteers are to be applauded by us all, as are those that volunteer in their homeland to give their time and energy to work alongside their professional fire and rescue colleagues for the good and safety of us all.

Right now, Australia in particular is bracing itself for bushfire season and only this morning advice from the government arrived telling me what to do in readiness for an emergency. Queensland, like other states, is torn between lowering the water levels in dams in readiness for excessive rainfall, or maintaining the water levels in expectation of drought. I am sure the government has no shortage of conflicting advice but the reality is that disasters, be they earthquakes, floods, cyclones, volcanic eruptions or tsunamis are chaotic events that answer to no man. In such events the role of the firefighter – indeed everyone concerned with rescue operations – is to attempt to defy nature. And that is a big challenge.

In many respects the German philosopher, Friedrich Hegel, was right when he said: "The only thing we learn from history is that we learn nothing from history." But thankfully he was not right all of the time. As those photographs in the Immigration Museum demonstrate, we may have learnt precious little as far as predicting natural events is concerned, but we have come a long way in terms of how we respond to them. Hopefully over the next ten years we will learn more and, who knows, we might even find ways of predicting them. APF

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James M. Shannon

NFPA

NFPA CONGRATULATES ASIA PACIFIC FIRE on its 10th anniversary and expresses its thanks for expanding the reach of important fire and life safety information by sharing it with its readers. NFPA looks forward to the magazine's continued efforts to improve safety in the region by offering coverage of compelling topics and emerging issues.

The Wildfire Priority

I wish we could say that the major wildfires we have seen in the United States and around the world this year were flukes caused by unusual weather conditions. But that is clearly not the case. Wildfire is not a problem limited to one region or one country, but rather an urgent international problem that will continue to grow and cost us billions of dollars in the coming decades unless we do more now to develop better policies to manage it.

The potential losses could be staggering. In the United States there are around 45 million homes that abut or lie in wildland areas, so it is easy to conceive of whole communities being wiped out as they were in the state of Texas. The good news is that there are things that we can do to make us better prepared to meet this challenge.

The first is to educate people who live in the vast wildland-urban interface on how they can take practical steps to protect their homes and communities. Through the Firewise Communities Program, NFPA, working with the U.S. Forest Service, has provided practical support to people living in fire-prone areas to make their communities safer. The concept is that neighbours come together, do an assessment of the threat, and develop strategies to mitigate. These can range from removing potential fuel from around houses to recommendations on fire-resistant building materials. There are now more than 700 communities in the United States that have taken steps to become recognised as Firewise Communities.

Wildfire is not a problem limited to one region or one country; it is an urgent international problem that will continue to grow and cost billions of dollars unless we do more now to develop better policies to manage it.

We are just beginning work on a new program with the Forest Service for fire adapted communities. This program is designed to raise public awareness by providing information and resources to help citizens reduce their wildfire risk and take collaborative action within their communities. Where Firewise focuses primarily on reducing ignition for existing homes and communities, the Fire Adapted Communities Program encompasses a broader scope that brings together landowners and land management agencies to address issues such as community planning and development, evacuation planning, landscape-scale fuel management, and regulations in the wildland-urban interface – all of which work together to create a human environment that is truly "adaptable" to nature's fire.

We are proud to work with other organisations that have long been involved in looking at various aspects of the wildfire problem. For years, the International Association of Fire Chiefs has been a leader in ways to protect the public, as well as firefighters, from wildfires. We will continue to coordinate our activities with the IAFC to ensure that NFPA codes and standards dealing with the protection of firefighter health and safety meet the needs of the fire service.

The problem of wildland fires is not just an American problem but an international one. Huge wildland fires have caused major destruction and dislocation of populations in recent years in Australia, China, Southern Europe and Russia. As we develop our strategies, we will continue to consult with our international colleagues to ensure that the lessons learned from these experiences are put to use to attack the wildfire problem globally. We recently gathered a group of international experts at our Backyards and Beyond Conference last October in Denver, Colorado (See article: "Addressing the Global Wildfire Challenge" on page 67).

It is clear that for at least the next generation the threat of wildfires will be one of the most important fire problems that the world will face, consuming more of our resources than anyone could have imagined just a few years ago. The threat today – to millions of people, to their homes, and to their communities – is exponentially larger than it used to be, and the economic consequences of wildfire over the next several years incalculable. We have to make this a higher priority and we must do it now. APF

Permission to reprint from NFPA Journal, Vol 105 No. 6.

James M. Shannon is President and CEO of the NFPA

For further information, go to www.nfpa.com

Panthers on the Prowl

A number of ROSENBAUER 12,000-litre Panther CA5 vehicles have been added to the Malaysia Airports Holdings Berhad (MAB) fleet of firefighting vehicles. Four units have been delivered to Langkawi and four to Kota Kinabalu International Airports, plus a further four will have been delivered to Penang and Kuching by the end of November with another three units for the new LCC hub at Kuala Lumpur International Airport (KLIA2) being delivered by the end of the year for operation on the third runway.

The MAB supply contract includes a 15-year maintenance programme, which will be undertaken by Rosenbauer's local partner in Malaysia, UMW Equipment, utilising its branch network throughout East and West Malaysia. All the units are fitted with Service4Fire connectivity to enhance the availability and reduce service time, as well providing MAB with a real-time perspective of the status of their trucks.

Also on its way to Hong Kong International Airport, a CA5 joins existing Rosenbauer vehicles at the airport and acts in the role of a rapid intervention vehicle (RIV). Operating with a water tank capacity of 9000 litres this Euro V engined Panther can reach to 80 kilometres-an-hour in 25 seconds in accordance with ICAO standards. It is fitted with a Halotron extinguishing system, which is particularly relevant for tackling aircraft brake fires where ceramics are used.

Rosenbauer says that by utilising a box frame for the chassis and the rigid axle with coil spring suspension, the Panther combines extraordinary cross-country ability with safety, while giving a comfortable ride for the crew. Unlike other suspension types, such as leaf springs and independent suspension systems, the flexibility of the rigid axle coil spring design enables the Panther to zigzag down a debris-strewn runway, which is the role of the first response RIV.

The complete firefighting system in all the Panther trucks is designed and manufactured by Rosenbauer, from the pump to the foam mixing, monitors, hose reels and control systems. This culminates in a seamless operation, allowing the operator to concentrate on his job, rather than trying to control everything from his console.

For more information, go to www.rosenbauer.com

South Korean Distributor Appointed

EARTHCLEAN CORPORATION, manufacturer of TetroKO, has signed-up SAM JOO S.M.C, a clean technology and industrial coatings company based in Seoul, South Korea as the country's exclusive EarthClean distributor.

TetraKO, the main ingredient of which is corn starch, transforms water into an adhering solution that can be pumped through standard firefighting equipment. According to EarthClean, it has proven to be far superior to other fire suppression products because a key attribute of its dual thickening agent causes it to stick and stay where applied. When heated by fire, TetraKO becomes even thicker and releases a dense steam, dramatically aiding in fire suppression.

The product has been independently tested by accredited laboratories, and has been certified ready biodegradable and non-toxic (aquatic and mammalian) using the USA's EPA Environmental Protection Agency) and internationally recognised OECD (Organisation for Economic Co-operation and Development) standards. Independent laboratory testing has also verified that TetraKO solution passes (NFPA) Uniform Corrosion metrics.

For more information, go to www.tetraKO.com

Singapore Pumps it Up

Photograph courtesy of Rock Productions

SPP PUMPS is supplying two of its multi-stage, multi-outlet fire pump sets for The Star, Singapore's new integrated cultural, retail and entertainment complex currently under construction.

According to SPP Pumps, the fire pump sets were chosen because they have LPCB (Loss Prevention Certification Board) approval, citing them as being: "one of the select few who have had their sprinkler and wet riser pumps subjected to the stringent performance and reliability tests of specialist fire approval laboratories worldwide".

Other Asia Pacific region project opting for SPP fire safety packages include the Marina Bay SandsTM resort where the company supplied its SPP BS08B split-case fire pump, and the Marina Business Financial Centre residential development.

For more information, go to www.spppumps.com

UL and FM-approved Sigma A-X

Packed with Performance

KENTEC'S new Sigma A-XT releasing panel is cleverly designed to be packed with efficiencies and performance for all small-to-medium fixed firefighting installations. Designed and manufactured to the highest standards, the A-XT meets UL and FM approvals and features extensive configuration options that permit the functionality of the system to be extensively modified with ease.

With three initiation circuits as standard, release can be configured to allow (among other combinations) any two from three type activations in configurations most often required for detection, such as ceiling void, room and floor void applications.

The large and readable LED display enables easy configuration and control, with the time remaining until release clearly displayed for added user safety. Releasing delays and releasing duration are configurable in five-second steps, with detection and sounder delays also configurable with comprehensive programming functions. In addition, the countdown timer can be duplicated on up to seven remote status units to provide local indication of the system status.

Other programmable options include use with I.S barriers, zero time delay upon manual release, non-latching zones to receive signals from other systems such as aspirating equipment or addressable modules and inversion of the low pressure switch input.

With all of the electronics mounted on a single, easily removable, steel plate, Sigma A-XT panels are both robust and easy to install. Sigma A-XT is supplied in an enclosure that matches the design and colour of the Elite RS range and is available in standard red or optional grey.

With its simple-to-programme flexibility, Sigma A-XT has all the intelligent solutions needed to enable modern fire alarm systems to be engineered and installed, simply and efficiently.

Kentec Electronics Ltd, the UK's leading independent manufacturer of fire detection and alarm control panels, has the most comprehensive range of conventional, analogue addressable fire detection and extinguishant control panels available. Kentec's total commitment to its customers is reflected in its sophisticated technical support and customised software development that offers many language variants for all mainline products. APF

For more information, go to
www.kentec.co.uk

Fighting Fires with the Right Tools

For more than 113 years, BULLARD has built a legacy of creating products that are uniquely designed with input from firefighters. By understanding the specific needs of firefighters, Bullard designs its thermal imagers and fire and rescue helmets to reflect their experience and input.

With Bullard products, you will find the ultimate in toughness and durability. You will also find extraordinary service and the most innovative designs. Bullard leads the industry with innovative thermal imaging and fire and rescue helmets designed specifically to meet the demands of firefighters.

The latest thermal imager from Bullard is the Eclipse – a low-cost, lightweight, personal-issue thermal imager designed for every firefighter. This ultra-small thermal imager is ergonomically shaped to fit in the palm of a firefighter's hand and lightweight enough to attach to turnout gear. Weighing 680 grams with a budget-friendly price, the Eclipse offers the fire service an opportunity to bring thermal imaging to more firefighters.

The Eclipse was introduced to the fire service in 2009 and since has become one of Bullard's most popular thermal imagers. Bullard offers the Eclipse in a standard 80 x 60 engine, but also in a 160 x 120 high-resolution engine that enhances the imager's versatility by providing firefighters with clearer, crisper and more detailed images, making the Eclipse perfectly-suited as an analytical and navigational tool.

The Eclipse can be equipped with optional advanced features including Bullard's exclusive Electronic Thermal Throttle (ETT). ETT aids firefighters in revealing hidden fire and distinguishing hotter objects, saving firefighter's critical time and preventing costly mistakes. Other optional features include high-heat colorization, temperature measurement and customised start-up graphics.

Bullard introduced its first fire helmet in 1930 and since has led the market in product safety with the development of the first fiberglass fire helmet in 1947. In 1983, Bullard manufactured the first NFPA-approved thermoplastic fire helmet and in 1986 the company developed the first ratchet headband used in a fire helmet.

The latest in fire helmet design and technology from Bullard is the Magma. The unique design of Magma allows the firefighter to configure a helmet to his/her exact requirements. Available in two lightweight configurations, Magma offers firefighters the design flexibility to choose a half-shell or three-quarter shell helmet. Magma's innovative shell material makes the helmet lightweight, weighing less than 1,400 grams.

In addition, Magma features just 29 components that can be easily assembled in just a few minutes. No other fire helmet consists of fewer components. The Magma design meets the requirements of EN443:2008, providing firefighters with the added confidence in the helmet's performance. Firefighters are well protected from the heat, flames, sparks and fluids.

A popular fire helmet among firefighters is the Bullard LTX structural fire helmet. The LTX Series offers firefighters a lightweight, thermoplastic structural fire helmet that incorporates more than 20 years of Bullard polymer technology and engineering expertise. The LTX is equipped with Bullard's M-PACT shell, providing users with increased protection and more headroom on the inside of the compact outer shell. This unique feature helps to keep the weight of the helmet evenly distributed on the head while maintaining the LTX Series streamlined design and lower centre of gravity.

The LTX Series helmets offer the Bullard U-Fit system with 12 comfort settings, allowing firefighters to adjust the ride and balance of the helmet for a custom-fit. Helmets also include Bullard's exclusive Sure-Lock ratchet headband that fits to the size of the wearer's head with a quick turn of the knob. The LTX Series structural firefighting helmet is compliant with NFPA 1971-2007. APF

For more information
please contact
bullardasia@bullard.com

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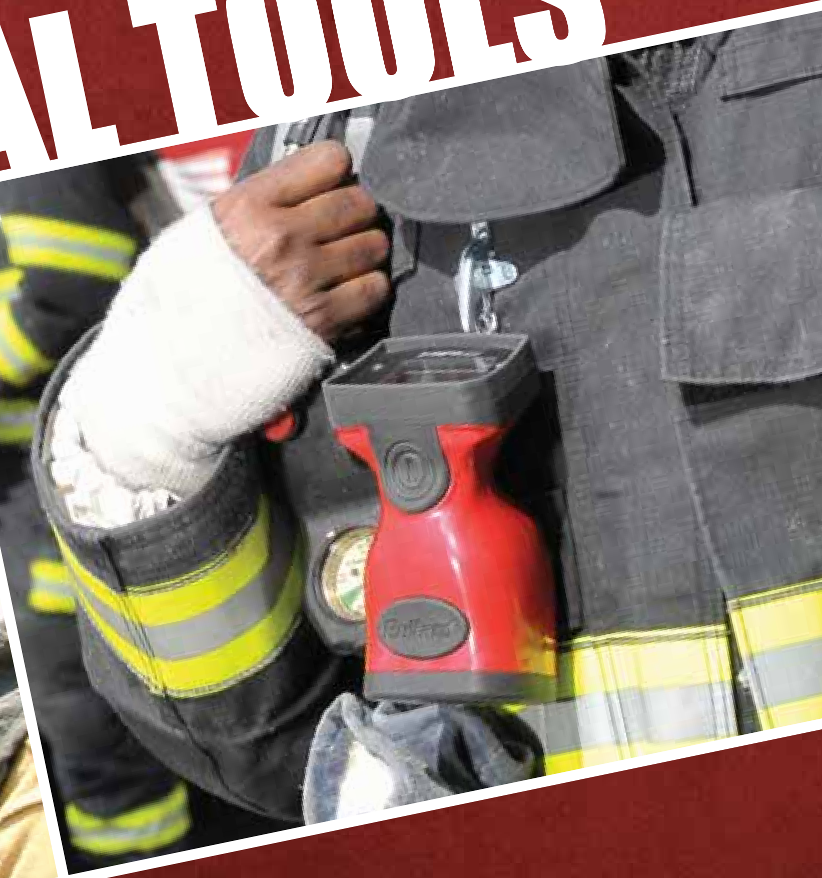

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LTX Fire Helmet

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NEW INNOVATIVE DESIGN

- Jet-style Fire Helmet
- Unique configurator platform
- Complies with EN443:2008 for both fire and rescue missions

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Raising the Bar

FIKE is claiming that its new LPCB-approved TwinflexPro fire alarm control panels are “setting new standards for versatility, convenience and value in two-wire fire protection systems” with features that include an integrated event log, a key switch control access facility, a wide range of delay functions and a convenient PC setup option.

The new panels are targeted at small and medium-sized applications, such as private hotels, guest houses and homes of multiple occupation. They allow detectors and sounders to share the same wiring to simplify installation and reduce cost. The new panels are available in two-zone, four-zone and eight-zone versions, with support for up to 32 devices in each zone. All sizes of panel share the same enclosure, and four-zone panels can be upgraded to eight-zone in the field.

TwinflexPro panels feature an integral data log that stores information for up to 500 alarm and fault events. The information can be recalled to the panel’s LCD display or downloaded to a PC, making it easy to investigate the sequence of events leading to alarm activations. The data log also aids maintenance and fault finding. When silencing or resetting an alarm, the new panels have provision for enabling control access with a key, as well as by entering a code.

The new panels provide two monitored outputs that can be configured as conventional sounder circuits, a feature that makes the panels well suited for use when upgrading existing conventionally wired installations. A delay function is also incorporated, which can be applied to any output. Setup can be performed either from the front panel or via a standard PC.

For more information, go to www.fike.com

New Earthquake Training Platform

VSTEP has launched a virtual training environment for earthquake disasters as part of its RescueSim virtual emergency response training platform, enabling emergency response teams to prepare and operate effectively after earthquakes. This is the latest addition to the RescueSim natural disasters library, which comprises response training for disasters such as floods, storms, bushfires and other natural disasters.

Its introduction is the result of close cooperation with the Chengdu municipality – capital of Sichuan province, an active earthquake zone – to provide a virtual platform that will allow the Chinese emergency services to train and prepare response strategies for earthquakes in the region.

The new training environment includes detailed parts of a large downtown city area and was integrated into RescueSim to allow emergency responders maximum immersion during training and to enable them to prepare true-to-life response strategies. The downtown area was then “torn down” simulating a major earthquake striking the city and creating a realistic training environment.

For more information, go to www.rescuesim.com

Vehicle sales to China on the Up

Firefighting vehicle manufacturer, PIERCE MANUFACTURING, has announced that vehicle sales to China have surged, with the company selling 75 fire and emergency vehicles in just the past 12 months.

The company delivered its first fire and emergency vehicles into China in June of 2010. This initial delivery comprised six pumper vehicles built on Saber custom chassis that met the stringent China Compulsory Certification (CCC) standards regarding product safety. These vehicles were delivered to Jiangsu Province. The new Pierce contracts are for high-rise pumpers, aerial ladders, and industrial pumpers for a number of fire departments across several provinces.

Among the recently sold vehicles is a Pierce Pumper for high-rise firefighting. This apparatus features seating for six firefighters, a 400 hp engine, five-speed automatic push-button transmission, a 3,800-litre poly water tank and 4,700 litres-a-minute two-stage pump. Current in-build vehicles destined for China include an industrial pumper and an aerial ladder.

For more information, go to www.piercemfg.com

Wouldn’t you want your next helmet to be certified to AS/NZS 4067?

Stadium's Kitchen Safety

Delta FIRE has supplied fire detection and suppression systems to protect the kitchens at the 27,400-seat Skilled Park stadium at Robina on Queensland's Gold Coast. The Park has three function rooms with a banqueting total capacity approaching 1000. The project utilises 17 of Amerex KP-PRM restaurant fire suppression systems, for which Delta Fire is the Australian distributor.

The Delta Fire solution protects the vulnerable cooking equipment and kitchen hoods with a pre-engineered installation that combines detection and suppression in a single package; a proven solution that uses linear pneumatic detection technology and a fast-reaction, low pH, wet chemical suppression agent that is ideally suited for cooking fat and grease fires.

The Amerex pneumatic tubing is routed throughout the hood, above the cooking equipment. This tubing is pressurised and is designed to rupture when exposed to a fire at a temperature of 224°C. This instigates the immediate discharge of the suppressant throughout the hood, duct and onto the appliances via a fixed-nozzle agent distribution network, quickly suppressing the fire and cooling the fuel, while securing the vapours with a smothering foam reaction. An additional feature of the system is that it interrupts the gas or electrical power to the cooking appliances prior to the suppression agent discharge.

For more information, go to www.deltafire.com

High Expansion Foam Approvals

FOMTEC has announced that its LS EXP foam has been approved to EN 1568 part 2, ISO 7203-2, and IMO MSC/Circ 670. It has also been verified for use in "inside air" applications after performing a series of independent third-party witnessed large-scale fire tests using the foam with Fomtec's Bele L generators against fires involving heptane, diesel, diesel spray, wooden pallets and E85 polar fuels.

Fomtec LS EXP can be used with fresh, sea and brackish water and will work with any type of high-expansion foam generator, such as water turbine fan models, spray nozzle models or electric fan models. It demonstrated expansion ratios in excess of 1000:1 during official tests using the test generator described in EN 1569 part 2.

It is claimed to have a strong bubble structure and very long collapse/drainage times to prevent the foam from collapsing. Tested on LNG, Fomtec LS EXP is said to work well as a vapour suppressant, due to its good stability and long drainage time.

For more information, go to www.fomtec.com

Foam Strategic Partnership

Firefighting foam concentrates and equipment company, THE SOLBERG COMPANY and ALERT DISASTER CONTROL (ALERT), an international emergency response and integrated risk management solutions service company, have entered into a strategic partnership covering the supply and use of firefighting foam concentrates.

Under the agreement, Solberg will supply Alert Disaster Control with Storm Alert foam concentrates – claimed by Solberg to be "the world's highest performing foam concentrates" – that are environmentally sustainable, being 100 percent fluorosurfactant and fluoropolymer-free.

"As ALERT continually expands its global emergency response and risk management solutions services, Solberg is committed to supporting them with leading firefighting foam technologies and performance products wherever they are needed," said Dennis Kennedy, general manager of Solberg "We appreciate the confidence Alert Disaster Control has shown with the performance of Solberg RF series foam concentrates."

Alert Disaster Control's experience embraces hundreds of oil/gas well firefighting and blowout control, critical well integrity, pressure control/snubbing, well control, relief well engineering and project management, marine and industrial firefighting, hazardous material control and toxic environment protection operations, worldwide. These operations included the first application of Solberg RF series foam concentrates successfully extinguishing fires involving industrial and process facilities, petroleum exploration assets, storage terminals and marine vessels.

For more information, go to www.alertdisastercontrol.com or www.solbergfoams.com

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Safety without Compromise

Intrinsically Safe Thermal Imaging for Firefighters

DRÄGER has introduced a new thermal imaging camera that sets its sights on offering a high level of safety and performance for firefighters and first responders. The UL-approved Dräger UCF 7000 thermal imaging camera is intrinsically safe and has been approved for use in potentially hazardous and explosive settings.

The new camera provides improved image quality in settings where visibility is very limited. With a high resolution 160 x 120 pixels, it provides responders with detailed images in any location that needs to be searched quickly and safely. The UCF 7000 can detect cooler objects in the scene, such as people, without sacrificing resolution on the high temperatures within the scene. According to Dräger, the result is a camera that provides a clear detailed image of the danger zone plus an integrated zoom that enhances the ability to reference hard-to-reach areas.

The UCF 7000 has three application-specific operating modes to optimise image display and facilitate emergency situation assessment. The three modes are for firefighting, search and rescue, and overhaul. The new ThermalScan operating mode enables responders to highlight a set temperature threshold when searching for hotspots during overhaul.

Responders can quickly assess hard-to-reach areas, as optimised image processing provides a quick overview in seconds. The 'snapshot' function captures a temporary freeze-frame thermal image that can be viewed on the display. This feature makes it possible to 'see around corners' when freedom of movement or field of view is limited. An integrated laser pinpoints hazards and aids communication between responders.

Its ergonomic design helps minimise fatigue when working in the most challenging environments, plus the camera weighs just 1.3 kilograms and can be operated using one hand. This improves mobility, especially for responders who must carry heavy firefighting and rescue equipment. The UCF 7000 offers various carrying options for optimal comfort and safety.

The IP 67 rated camera's housing can withstand the most extreme conditions unharmed by water, dust or other contaminants. It is heat resistant and can withstand mechanical stress, providing up to four hours of operating time for extended operations.

For more information, go to www.draeger.com

Enhanced Gas Detection

XTRALIS has introduced an enhanced version of its Vesda ECO gas detection product, which is a gas detection extension of its aspirating smoke detection (ASD) system, which is used in over 400,000 early warning and detection applications worldwide. The enhancement includes six new gas detection options, as well as additional programming, testing, and monitoring capabilities.

The Vesda ECO approach to gas detection utilises multi-hole aspirating technology that, the company says, provides superior gas detection and removes the guesswork in gas detector placement. By utilising a Vesda pipe network, ECO is claimed to offer a significantly lower total cost of ownership, citing savings of up to 46 percent on initial capital expense, and up to 76 percent in operational expenses when compared with conventional gas detectors.

The new gas detection capabilities are for alcohol, gasoline vapour, pentane, chlorine and carbon dioxide, along with additional oxygen and ammonia sensing. The new version also adds an intuitive calibration process, field programmable "calibration due" notifications, and a simulation capability of gas tests to analyse the system's functionality and performance.

For more information, go to www.xtralis.com

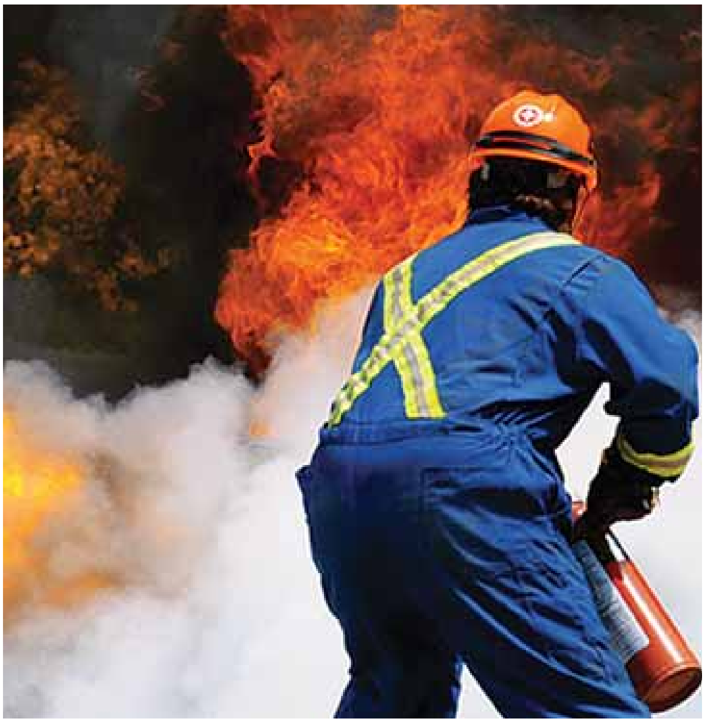
Network Expansion

Vehicle manufacturer, CTE has added to its Asia Pacific distribution network with the appointment of a distributor in Vietnam. The company also has representation in Australia, China, Singapore, Hong Kong and Malaysia.

For more information, go to www.ctelift.com

K V Fire – A major Force in the International Marketplace

For more than two decades, K V Fire Chemicals has specialised in the manufacture and supply of firefighting and fire suppression chemicals, in particular powders and foam concentrates.



In addition to being one of India's premier specialist fire protection companies, K V Fire Chemicals has created a considerable presence, particularly throughout the Asia Pacific region and the Middle East. It currently has a customer base spread across 38 countries and has ambitious plans to develop other markets across the world.

Today, its key markets include the petrochemicals industry, defence, aviation, power generation, manufacturing industries, maritime applications and both municipal and industrial fire and rescue organisations. In addition to its core products of powders and foam concentrates, the company's expanding portfolio includes: portable fire extinguishers; foam production, storage and delivery hardware; and the latest development – water mist technology.

The K V Fire Chemicals foams offering includes, among many others: AFFF concentrates; Class A concentrates; an HEF concentrate developed specifically for fighting engine room and aircraft hangar fires; and a Class K foam for oil and fat fires. In terms of foam generation and delivery hardware, the company's comprehensive line-up embraces: foam makers; sprinklers; chambers; bladder tanks; and bladder proportioners. The company also manufactures a mobile foam delivery unit that comprises a foam inductor, foam branch pipe, a concentrate storage tank and two lengths of fire hose.

The current widely-approved dry powder offering from K V Fire Chemicals includes the UL Classified KV Lite POWEREX, which is now used extensively by its customers in portable fire extinguishers, fixed delivery systems and power cannons. The company's portable fire extinguisher range includes both standard fire risk and special application models that are UL-listed and come with a six-year guarantee.

The latest addition to the K V Fire Chemicals portfolio is a water mist system – the K V Fire Ultra Mist system – which is available as a portable 15-litre (30kg) back-pack system or 50-litre (100kg) trolley-mounted unit. Both of the low pressure systems are dual mode and can deliver the water mist as either a jet or a fog.

This clean agent water mist system reflects the company's on-going commitment to developing, manufacturing and marketing fire suppression and fire extinguishing solutions with the least possible negative impact on the environment. It also reinforces the company's growing international reputation for manufacturing excellence and producing systems and products that represent value for money, robustness and low in-use cost.

The company, which was established in 1988, is headquartered in Navi Mumbai with a 20,000 square metre manufacturing, logistics and development facility in Mundhegaon, Nashik. The company is certified to ISO 9001:2008, ISO 14001:2004 and OHSAS 18001:2007. APF

KV FIRE

For more information, go to www.kvfire.com

Argus Thermal Imaging

As a leading technology innovator, Argus Thermal Imaging from e2v has a long history of supplying revolutionary solutions to the world's firefighting markets. Starting with the Pevicon-based Argus, Argus has since introduced the Argus2, Argus3 and more recently a range of Argus4 cameras to an ever more educated customer base, continuing to revolutionise the market with advanced technological developments.

Argus cameras are designed to the highest specifications to instil confidence in emergency services personnel that they are using the best thermal technology available to them. Argus cameras enable firefighters to see through smoke, identify and rescue casualties and locate hot spots within the fire area. They aid police and security forces to apprehend criminals and gather evidence, saving lives and property in the process.

Argus consistently strives to respond quickly to changing customer demands with even greater technological advancements. Customers need apparatus to suit multiple applications and budgets: the Argus camera comes with a choice of detectors from super-high-resolution 320 x 240 to 120 x 160 detectors but all providing the best image quality on the market. The Argus4 casing is made from high quality Radel R-5100, which is chosen for its strength, resistance to heat, water and impact. The camera is sealed to IP67, to withstand driving spray and immersion in water, and can tolerate extremely high temperatures.

Argus cameras offer two types of temperature detection to aid firefighters in determining the heat of their surroundings. Ambient temperature measurement gives firefighters rapid identification of that particular area's temperature within the fire environment. Notification of these temperatures can indicate dangerous situations and the firefighter can make a decision whether to evacuate the premises or continue the search. Spot temperature measurement enables firefighters to pinpoint the exact heat of objects or obstacles. This saves time and extinguishing facilities by allowing firefighters to focus on the hottest part. This option enables fast and effective location of the seat of a fire or detecting hot-spots in cavity walls or behind doors. Additionally, this feature can be useful for determining the temperature within enclosed capsules or spaces, even measuring the temperature of gas cylinders.

Temperature sensitivity modes are now used to expand the dynamic temperature range of the cameras; Argus cameras have three modes to further increases the viewable temperature range up to 1000˚C. The image on a camera LCD screen can move seamlessly from a cooler scene to a very high-temperature scene without loss of detail "whiteout". It also means that a body located in very high temperatures can still be seen by the cameras handler.

Argus cameras offer unparalleled image quality, not only allowing firefighters to view images in far more detail than is possible with other cameras; the latest offerings allow full colorisation options. Various screen colour settings enable firefighters to switch from monochrome all to the way to full colour. This makes detecting changes in heat and finding the hottest part of an image on the screen easier, faster and more reliable, saving vital seconds in scene assessment. A person requiring rescue in water gives off more thermal radiation than his or her surroundings, therefore presenting a distinctive shape on a thermal cameras LCD screen. Certain colour pallets give a better image than others.

Coupled with improved image quality comes image and video capture. These features allow firefighters who are using the camera to take pictures or footage at the scene of a fire. This is a significant aid in mapping the layout of the scene as taking images while assessing the scene will provide a valuable insight to other firefighters before they enter a building, helping them to avoid obstacles, locate doorways, and stairs hidden by the thick smoke.

e2v engineers have over 30 year's experience designing the very best in thermal imaging technology; they were the first to provide the fire industry with thermal cameras in the 1980s and now continue to provide the most innovative products in the battle to save lives and property. APF

For more information, go to
www.argusdirect.com

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We know this because fire departments all over the world test our range of cameras to their limits and they just keep on performing.

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Wired in a Wireles

Urban Search and Rescue Teams face tremendous physical and emotional challenges when responding to disasters. For this reason alone, the equipment they use must perform in the toughest of circumstances and be reliable in all environments. CON-SPACE Hardline Gear is a USAR team's best choice for rescue operations below ground and in confined spaces – places where wireless communication is not dependable.

When USAR personnel enter a confined space for a rescue operation, maintaining voice contact with the outside world is important. Feelings of claustrophobia, stress or panic can be experienced by even seasoned responders and, while these feelings can be controlled, they can surface very quickly if a problem occurs, with disastrous consequences. Continuous electronic voice communication is one of the best ways to provide responders with a support system when entering a confined space. Hearing a friendly voice allows entrants to maintain an acceptable comfort zone for the duration, while helping to keep feelings of claustrophobia and panic in check.

Some USAR Teams choose to use wireless systems, which can work perfectly well above ground. However, when rescue efforts are required below ground, in a collapsed structure or in a confined space, hard wired systems are much more trustworthy. Wireless equipment does not perform well in many enclosed spaces for a variety of reasons. In these environments, radio communication is subject to dead spots, fading and weak signals. In addition, radios and mobile phones can be extremely hazardous in and around fuel tanks and explosive ordinance, primarily due to Effective Isotropic Radiated Power (EIRP). Another commonly overlooked aspect of wireless equipment is that radio frequency allocation is becoming more difficult and transmissions over public bands are subject to unwanted, or outside monitoring and/or interruption from other radio users on the same channel or channels.

Portable radios (and some mobiles) operate on a PTT or "push-to-talk" basis, requiring responders to stop what they are doing, or take their hands off what they are doing in order to communicate. To address the PTT issue, some have turned to "hands-free" or "voice activated" (VOX) accessories, however these work reliably only in low-to-medium noise environments. In high noise areas, VOX accessories are plagued by false activation, which triggers the electronic push-to-talk switch and can inadvertently lock a radio into transmit mode, cutting off all communication.

With the previously addressed shortcomings of many wireless communications systems, Con-Space Hardwired communications systems are the best investment for any USAR Team. That is because hardwired systems typically excel in areas where radios fail. Con-Space Hardline gear is:

- Electrically shielded
- Extremely rugged
- Resistant to chemicals

For more information go to
www.con-space.com

s World

Function	Rescue Kit 1P	Rescue Kit 3	Rescue Kit 5P	USAR Task Force Kit	Victim Locator Kit Structural Collapse	Bomb Disposal Kit	Mine Rescue
Application	Standard	Basic	Enhanced	Multi-Purpose	Basic	Standard	Basic
Total Number of Users	5	3	6	Multi-User	1	3	3
Number of Entrants	4	2	4	4	–	2	–
Number of Safety Attendants/ Hole Watch	1	1	2	2	1	1	–
Entrant Distance(m)	30.5	30.5	30.5	91.5	7.5	31.5	457

*Additional cable may be added for increased distances up to 457m

- Environmentally sealed
- Water and dust-proof
- Intrinsically safe

At first glance, the biggest drawback of Hardline communication is the cable itself. The major issue being that there is a limitation in terms length of the cable; in addition, the cable can snag or become caught on debris in a collapsed structure. However, it is still more beneficial to have a guaranteed, constant line of continuous communication between the responder and the safety attendant above ground – without the worry of interference, dead spots, or the radiation of potentially dangerous or destructive radio signals.

Full duplex Hardline systems are completely hands-free and provide a dedicated and private network for responders as they are working. During rescue operations where a supplied air breathing apparatus is required, the communication cable can be "piggybacked" onto a breathing air line, making a single umbilical that is easily managed by the entrant. Con-Space's Hardline Gear provides a secure lifeline between responders and safety attendants, eliminating worry of disconnection or interference.

Accessories for the portable Con-Space Hardline systems include:

- Pass through connectors for chemical suits
- Face mask communication accessories
- High noise headsets
- Alarm options
- Two-way hands free talk boxes

Con-Space Hardline systems can be customised, providing USAR teams with the ability to outfit their crew appropriately and transfer into a range of rescue scenarios. The systems can be used effectively within high noise environments and can be easily put to work alongside any face mark, breathing apparatus or enclosed suit, enabling USAR teams to tailor their gear to best fit their rescue strategy. Some examples of these customisations include:

- Two distinct acoustic couplers. This creates an opportunity to integrate the Hardline system to a telephone or tape recorder, which provides a link to outside personnel, wherever they might be.
- Add an Alarm. When connected to the CSI-2100, the alarm module allows any entrant to initiate a 110db alarm from inside the space and it can also be set off by a safety attendant to call the rescue team.
- Line Management. We offer a complete line of cable reels and coilers to help you manage and store your Hardline cables safely and efficiently.
- Umbilical Covers. Tag airlines and communication cables in one single umbilical for more efficient line management.
- Expansion cable to add an additional command module. Connects two CSI-2100 command modules together for a total of eight users. Add two cable splitters and two double splitters for a total of 14 users. Available for 2100 Module only.

Con-Space Hardline products are intrinsically safe, ruggedly built, waterproof and dust-proof – this permits the rescuer to get his or her job done, without worrying about damaging the equipment. Above all else, the best reason to choose Con-Space's Hardline Gear is simply due to our track record of providing reliable, durable and proven communication where it is needed. We stand by our products and have engineered them to work whenever and wherever you need them.

Kits for Rescue Operations

All kits provide hands-free, full duplex (simultaneous two-way) private communication between the victim, rescuers and safety attendants. They are designed for rescue operations in confined space, collapsed structures, high angle rescue and trench rescue. **APF**

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Pic courtesy of Frederic Gil

Australian Foam Forum Raised Important Questions

Mike Willson

Willson Consulting

Australia held its first National Forum and Workshop on "Fire Fighting Foams and the Environment", recently, as part of the major Clean Up 2011 Conference, which raised some important questions.

Interesting updates from European and Australian regulatory organisations, five presentations from Fluorine Free Foam (F3) supporters and two from fluorine containing foam supporters, stimulated thought provoking questions. The discussion was unusual because it declared a key objective at the start "To produce a position paper for foam procurement", which soon became a vital part of the proceedings.

Several delegates were sceptical, as the conference had been organised and sponsored by a single F3 manufacturer, which led to the first important question: Should we only value discussions where all sides of a difficult issue are encouraged to work together, to provide realistic outcomes and workable solutions?

Positive Position Paper

It became clear that this position paper was starting a process to develop and implement a sound, secure and prudent procurement policy, in a co-operative atmosphere of sharing and learning. Undertaken by a Government organisation and delivered by a powerful partnership of science, industry and Government called CRC – Care, which was set up to devise new ways of preventing

Pic courtesy of Frederic Gil

and ameliorating soil, water and air contamination. Technical input seemingly comes from a single F3 producer and sponsor of conferences, which is concerning and hardly seems right. Would not this policy, like any other, benefit from diverse inputs of a broad range of stakeholders – strengthening, informing and benefitting the outcome?

I was privileged to be part of the UK Department of the Environment's world leading Risk Reduction Strategy for PFOS, as a stakeholder representative, where this inclusive approach worked well. Why could not such a diverse stakeholder engagement format be followed here? At least a draft policy document should be passed around this delegate group. It represents a "ready-made" well informed, diverse and interested "sub-set" of stakeholders, on which to build. Only time will tell whether this happens, but at least a list of attendees plus contact details was circulated – an important first step.

A risk and impact assessment approach was favoured for adoption to cover Class A and Class B foams, with possible essential uses in certain areas. Acceptance of different foam suitability for different hazards, plus improving containment profiles, would help justify some foam types over others. A desire to establish what is fit for purpose, a review of containment, mitigation measures and disposal options, was also agreed. A number of gaps in our knowledge were highlighted, that would need answers to better inform the resulting position.

While we only expected to set some broad policy headings in such a short forum, it was important to define and clarify key parameters, and identify key gaps in current knowledge. Both are pre-requisites for any meaningful policy. Now we had the potential for a genuine attempt to place clear, fair and possibly unbiased guidelines of significant potential benefit around the world, not just in Australia.

A very balanced and frank approach came from NICNAS (Australian National Industrial Chemicals Notification and Assessment Scheme), which is working hard to scrutinise new chemicals and develop a framework of controls for Persistent, Bioaccumulative and Toxic (PBT) fluorochemicals like PFOS.

A very balanced and frank approach came from NICNAS (Australian National Industrial Chemicals Notification and Assessment Scheme), which is working hard to scrutinise new chemicals and develop a framework of controls for Persistent, Bioaccumulative and Toxic (PBT) fluorochemicals like PFOS. It seems NICNAS accepts the need to separate these undesirable PBT chemicals deserving tight controls, from PFOS-free foam concentrates, increasingly using C6 telomer-based fluorosurfactants that deliver fast fire control with firefighter safety benefits.

Regulatory Environment Update

Germany took the most precautionary approach having set threshold levels for perfluorinated carbon compounds (PFCs) in drinking water and sewage sludge in 2010. Underway are a range of studies into PFC build up in soil, groundwater and vegetables. After bans on usage and storage of PFOS based chemicals in Europe (June 2011), with disposal by high temperature incineration, concerns continue over persistence and transportation into remote areas. Strict international regulation on the use of PFOS under the 2009 Stockholm Convention has still not been implemented by most signatories outside the EU.

The US Environmental Protection Agency developed its PFOA stewardship program, which although voluntary, has been adopted by several major fluorochemical producers including Du Pont, who are ahead of schedule, exceeding 95 percent reductions by 2010. The company expects to achieve complete phase out of PFOA ahead of the 2015 target date. Canada legislated management of PFOA in 2010, ahead of its intended future phase out.

Norway and Germany are proposing restrictions on PFOA, particularly in consumer products, effective from 2016. Surprisingly there seems no concerted action from United Nations, which could minimise the use of PBT substances quickly, and reduce environmental build up.

Concerns were expressed that currently in Australia no written policy exists on the use of Class B fire fighting foams. Western Australia's (WA) Department of Environment and Conservation is taking up this challenge with a more holistic and balanced approach, recognising that no environmentally benign foam exists, as all foams have some impact on the environment. Should we also be considering other important aspects including fire performance, efficiency, fire-fighter safety, incident escalation, aerial pollution, business interruption and loss of employment? Only then can the best and truest decision be made. Equally important are potential pollution incidents from oil emulsification, foam containment and disposal methods, plus soil and water remediation. There are large variations in fire performance and environmental impacts between different foam concentrates, for example, inherent benefits of modern detergent-free natural protein AR-FFFP products, which do not emulsify hydrocarbons and deliver low aquatic toxicity.

Aviation Implications

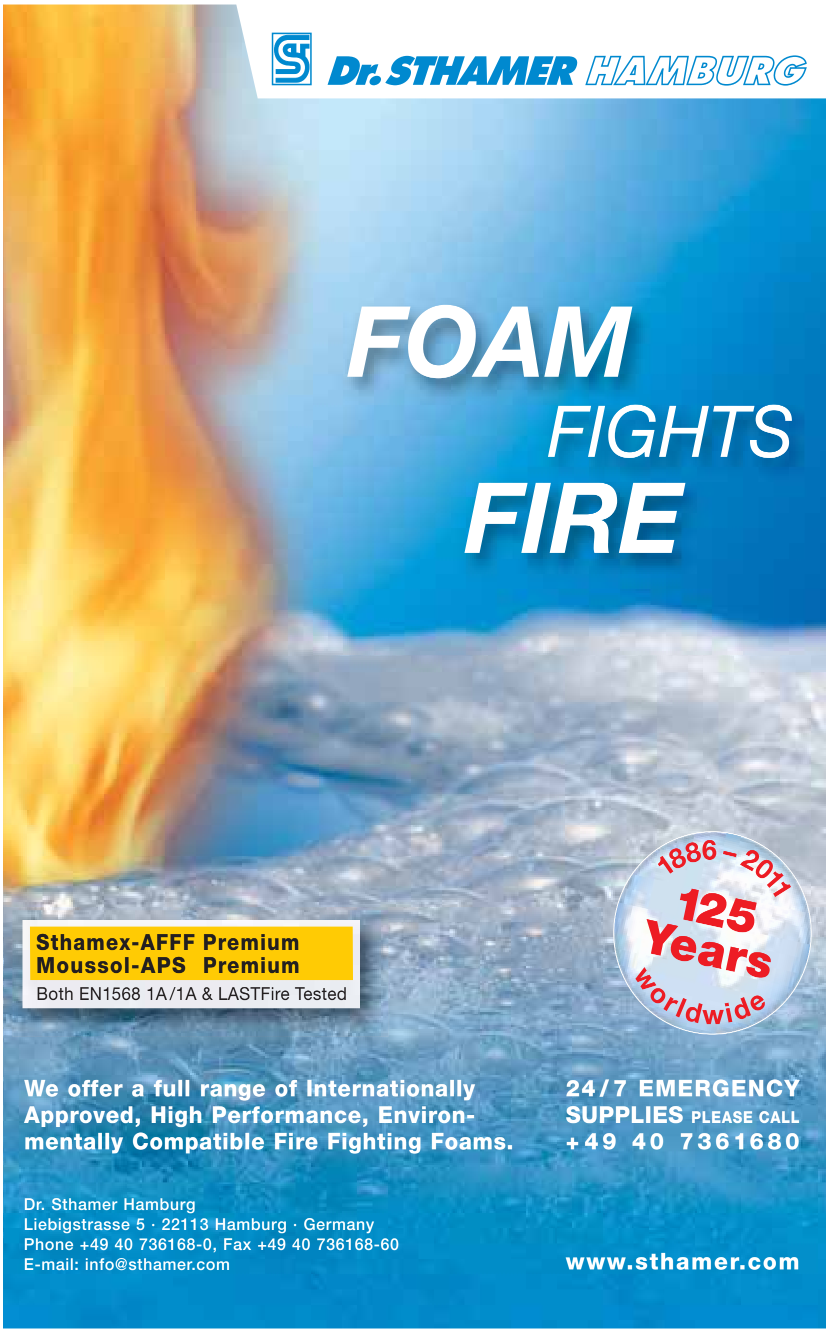
Research has shown that AFFF foams containing telomer-based fluorocarbon surfactants require up to three times less concentrate used on a given fire scenario, than alternative F3 products. This requires significantly less concentrate and water resources, plus less fire water run-off for collection and treatment. In a time critical application, could not this extra control time potentially cost lives?

NRL Testing

Recent US Naval Research Laboratory testing has shown fluorotelomer surfactant containing Mil F AFFF agents on a 2.6 square metre pool fire extinguished all four different hydrocarbon fuels tested within the 30 second performance criteria. This was between 70 percent and 88 percent faster than F3 foams. Research has shown this is largely due to the aqueous film forming ability of the fluorotelomer surfactant chemicals, when used through non-aspirating nozzles. These film-forming products maximise travel distances, keeping firefighters a safe distance from the fire, minimising wind effects. This maximises fire-fighter safety, achieves exceptional fire extinguishing performance, and provides the opportunity to quickly save lives. Can this be said of F3 alternatives, which should be applied aspirated, do not meet the Mil F criteria even at full strength, and have a tendency to sudden flashbacks, particularly when burning or incandescent materials are present?

Airservices Experiences

Airservices Australia operates air traffic and other essential airport services including Aircraft Rescue and Fire Fighting (ARFF), in all 39 airports around Australia. They are implementing a change-over from AFFF 6% to 6% F3 across the nation. Detailed and time consuming, this change-out process ensures no residual contamination in equipment, trucks, or even PPE gear.



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It was surprising to hear that they do not see their priority as extinguishing aircraft fires, preferring it seems to control them and evacuate personnel. Supposing flashback or re-ignition occurs during evacuation? Does this conflict with perceptions that rapid extinction delivers maximum opportunity to save casualties and protect firefighters from danger? Reducing Australia's fire test criteria to ICAO Level B from above Mil F standard, and many would say reducing its fire fighting capability from AFFF to F3 seems strange, when aircraft are more complex, more frequent, often with more passengers and more fuel – so does this make real sense? One would expect a tightening of requirements, perhaps a focus on extinction before trying to evacuate casualties, to reduce inherent risks of sudden flashbacks threatening passengers and firefighters alike – not the reverse?

Rigorous Testing

Mil F approved AFFFs have to extinguish the same 2.6 square metre fire tray at half strength within 45 seconds, recognising that only one fire truck may be able to reach the incident quickly, that a nozzle may become partly blocked, or some unexpected error occurs, restricting foam application to the fire. A safety factor is built-in so the foam still safely gets the job done, under less than ideal circumstances. This seems to be missing with F3 foams. NRL testing suggests there is no safety factor with F3 foams, and seemingly often no extinguishment within 45 seconds, even at full strength. So why are we accepting F3 so readily?

A strong realistic approach was adopted, recognising that all foams have an environmental impact, so substituting one variety for another, does not solve our problems. How do we maximise the benefits from using any foam as sparingly as possible?

Individual risk assessments would match different solutions for specific applications. Should we restrict ourselves from the best answers, because we fear what may happen in future? Should we only consider new alternative approaches after rigorous life-size testing? Should we grasp the first potential answer, when it fails to deliver the robust solution we seek?

Way Forward with Telomer-based Fluorosurfactant Foams

A strong realistic approach was adopted, recognising that all foams have an environmental impact, so substituting one variety for another, does not solve our problems. How do we maximise the benefits from using any foam as sparingly as possible? Reduced loss of life, fast and efficient extinction, reduced atmospheric pollution and toxic gas releases, minimised incident escalation, and firefighter safety are all benefits derived from firefighting foams, but probably maximised by using telomer-based fluorosurfactant products.

Risk Reductions

A four-level hierarchy of risk reduction was discussed and used in the later forum session, from elimination by design; minimisation by design; use of appropriate engineered safeguards; and administrative controls (for example, safe work practices). It needs improved containment like bunding of foam and fuel storage tanks; better waste water collection with oil interceptors, spill containment kits, disposal through waste water treatment, plus improved operational procedures and work practices to make a difference.

Should we be considering these alternative, possibly better, approaches to minimising our environmental impacts, at least until better second generation F3 foams are developed that address some of the problems associated with current offerings? Minimised aquatic toxicity, less foam concentrate used, yet highest levels of fire performance are being delivered by modern C6 fluorotelomer surfactant-based products. Subjecting them to improved collection, disposal and treatment could be the way forward.

Fire-water Treatment

Exciting research has been conducted by Du Pont to purify fire-water run-off collected after a fuel separator. This showed surprisingly effective results for both fluorinated and F3 foams. This pilot system used a four-part separation: electrocoagulation; flocculent segregation; reverse osmosis treatment and final activated carbon polishing. It reduces initial fluorosurfactant concentrations of 115ppm (parts per million) in the run-off down to 31ppm after flocculent segregation, down to 10-16 ppb (parts per billion) after reverse osmosis and activated carbon polishing, in two hours. It was equally effective at removing harmful hydrocarbon surfactants from F3 foaming agents, reducing their aquatic toxicity. This approach could be a credible solution to all these problems?

Initial equipment cost is currently high, but the operating costs of effluent treatment are reassuringly reasonable at around 1US\$/m^3, pointing a way forward to possibly having the best of both worlds: barely detected perfluorinated compounds in treated water released back to the environment, while retaining the most effective and efficient C6 fluorotelomer surfactant based firefighting foams to maximise fire performance and minimise environmental impacts. Perhaps this is the answer of the future, for all foam type applications?

Conclusion

Despite lacking answers to many of these important questions, both the organiser Dr. Klein, and Dr. Healy chairing the main discussion, are to be congratulated on the positive atmosphere produced and its contribution to this important debate. Developing a meaningful policy document, with as much diverse stakeholder input and rigorous questioning as possible, is a worthy outcome.

This conference scored highly by raising more questions than answers in a stimulating, co-operative environment, and has contributed to this long running debate. Let us hope we see good resulting actions. APF

Mike Willson is a firefighting foam specialist

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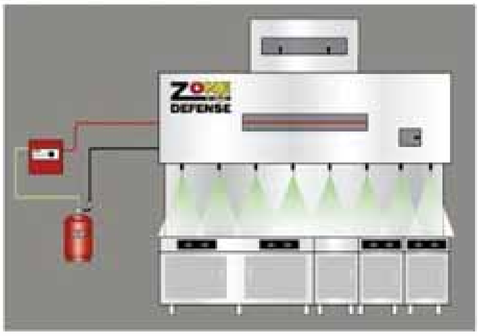

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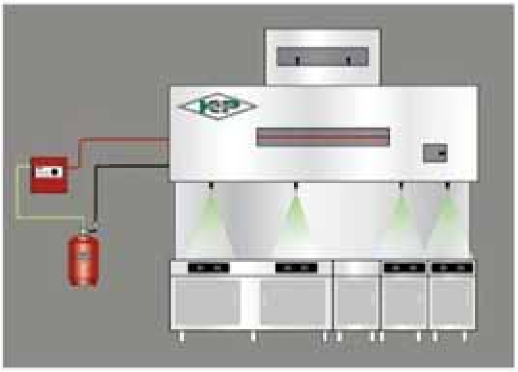

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The Commercial Kitchen Fire Challenge

Bob Grieve

Delta Fire Australasia

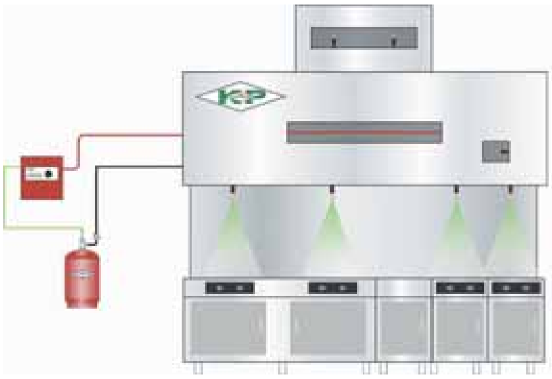
Restaurant fires typically start in the kitchen. Annually they cost millions of dollars in lost revenue and repairs, risk the lives of staff and diners, and cost tens of thousands of jobs. However, restaurant kitchen fires are preventable if appropriate suppression systems are installed, tested and maintained, and if management implements effective cleaning and grease removal regimes and safe working practices.

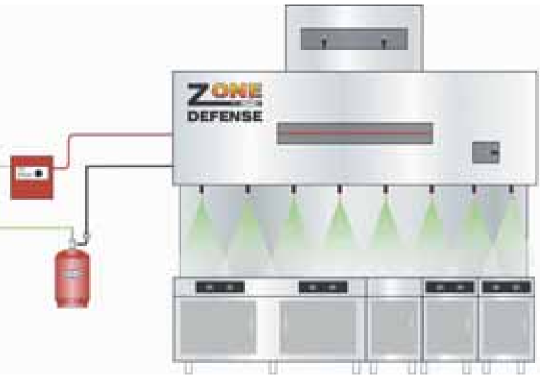
There are between 14,000 and 15,000 cafes and restaurants in Australia, providing employment for over 145,000 people and generating a total revenue in 2010 of an estimated Aus $9,877 million. That being said, many in the industry argue that there has never been a more challenging time to make an acceptable profit, due to fast-escalating costs, so, the need to maximise productivity and customer throughput has never been more important. However, that is an endeavour that can be easily thwarted – either temporarily or permanently – by an out-of-control kitchen fire.

And make no mistake – commercial kitchen fires do occur. Australian kitchen fire statistics are difficult to come by but, according to USA's NFPA [National Fire Prevention Association] findings, an average of 11,100 fires take place in eating and drinking establishments every year in the USA. Half of these have their origin in the kitchen. Cooking materials are the most frequent first item ignited in a kitchen fire; a view shared by many Australian fire safety experts and confirmed by the majority of post-fire reports.

For example, deep-fat fryers use flammable cooking oil, which can result in grease build-up in hoods and ducts that should be cleaned and maintained on a regular basis. If this grease build-up ignites, it can contribute to the swift spreading of a fire. The three primary types of equipment involved in restaurant cooking fires, again according to the NFPA, are deep-fat fryers, cooking ranges and cooking grills.

However, it is important to appreciate that protecting the cooking equipment is only part of the kitchen fire safety equation. It is equally vital to protect the ductwork. Grease vapours given off during the cooking of nearly all types of food will accumulate on the hood, in the duct and fan of





the exhaust system. This grease residue is combustible at approximately 370°C and the heat within a cooking appliance flare-up can easily reach 1100°C. So, if the flames linger long enough in the hood or duct, the internal grease build-up will ignite, with the potential to develop into an uncontrolled fire that can be quickly "sucked" through the entire length of the duct.

These challenges demand careful and detailed consideration, particularly as there are advocates of a number of different solutions. These include: "tailored", bespoke or engineered systems; pre-engineered systems; and portable hand-held extinguishers.

"Tailored" fixed fire suppression systems are, as the term implies, design specific, while pre-engineered systems do not require the involvement of a design engineer beyond the original product and system configuration. Pre-engineered systems are made of pre-designed components and are, by far, the most popular solution for commercial kitchen fire suppression. Probably the best known systems in this category are Amerex Corporation's KP and ZD and Ansul's R-102 restaurant fire suppression system. Portable extinguishers are no substitute for pre-engineered fixed suppression, but they do have a valuable role to play in ensuring kitchen fire safety.

It is important to appreciate that protecting the cooking equipment is only part of the kitchen fire safety equation. It is equally vital to protect the ductwork.

While some advocate the use of water sprinkler heads over deep fat fryers, their use can, in some cases, be shown to be ineffective, particularly when compared with the quick knock-down, cooling and smothering action of wet chemical systems. A report by FEMA (Fire Equipment Manufacturers' Association) entitled "Wet Chemical Pre-Engineered Restaurant System/Water Sprinkler System Comparison" concluded that: "*…water sprinkler systems do not always compare favourably with wet chemical systems and, in fact, there are some important reasons why wet chemical systems are most often preferred by the industry's authorities having jurisdiction and end users.*"

The report went on to conclude that: "*The most important factor to be borne in mind is that pre-engineered wet chemical systems provide complete protection to all hazards simultaneously and are UL tested and listed specifically for restaurant hazard applications. Agent characteristics, simultaneous coverage, and specific test criteria make pre-engineered wet chemical systems the state-of-the-art fire protection system for restaurant application and the choice of the industry's buying influences.*"

Regulatory Compliance

In terms of fixed systems, there are a number of standards that need to be taken into account, depending on the type of system installed. These include Underwriters Laboratories Standard UL 300 [Fire Testing of Fire Extinguishing Systems for Protection of Commercial Cooking Equipment] that was introduced in 1994 and has been subsequently amended and updated.

The relevant Australian standards are AS/NZ 1668 Set: 2005 (The use of ventilation and air-conditioning in buildings) and AS 1851: 2005 (Maintenance of Fire Protection Systems and Equipment) and AS 3772: 2008 (Pre-engineered fire protection systems for cooking equipment).

Overseas, there are three of the USA's National Fire Prevention Association's Standards: NFPA 96: 2011 [Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations]; NFPA 13: 2010 [Standard for the Installation of Sprinkler Systems]; and NFPA 17a: 2009 [Standard for Wet Chemical Extinguishing Systems]. The relevant UK standard is the LPCB's (Loss Prevention Certification Board's) LPS 1223 [Requirements and Testing Procedures for the LPCB Certification and Listing of Fixed Fire Extinguishing Systems for Catering Equipment].

The UL 300 Standard is a fire test method that applies to pre-engineered extinguishing system intended for the protection of commercial cooking areas. In addition to fire test methods and requirements to protect the various types of cooking appliances, this Standard includes tests and criteria for evaluating the ability of the pre-engineered equipment to protect plenums and ducts.

The requirements in UL 300 take into consideration the characteristics of pre-engineered systems, including its self-contained supply of extinguishing agent. Since the quantity of extinguishing agent is generally limited, and the effective discharge of the agent is over a short period of time, these systems are required to quickly extinguish test fires as part of the UL 300 evaluation. It is therefore essential for specifiers, installers and restaurant owners, when selecting such a kitchen fire suppression, to ensure that it is tested to UL 300

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and installed to AS 3772, as so many regulatory authorities, fire services and insurance providers are unfamiliar with benefits of a wet chemical suppression system and with this standard.

Assured Reliability

A careful reading of these standards, and particularly those relating specifically to commercial kitchens, highlights a vital important requirement, namely the need for systems to be performance tested. Indeed, UL 300 even refers to "fire testing" in its title. In reality, this testing can be achieved only with a pre-engineered system. By its very definition a tailored, bespoke or engineered solution cannot undergo any performance testing regime; performance can be substantiated only by theoretical calculation and so cannot possibly be claimed to comply with UL 300.

The most sophisticated of these pre-engineered systems can be triggered automatically or manually and offer the option of either an "appliance-specific" design, where nozzles are aimed at particular fire hazard areas of each appliance, or an "overlapping" design, where discharge nozzles are configured to overlap and provide a "fire-free zone" across a group of appliances. Both types are renowned for quickly detecting and suppressing high temperature cooking oil fires, using proven fusible-link or pneumatic tubing detection and release system technology. Immediately the system detects a fire, the gas or electric power to appliances is cut-off.

The "appliance-specific" design invariably provides the most economical use of the suppression agent, as it reduces the size or number of storage cylinders and associated hardware. However, when flexibility and simplicity are particularly important considerations, "overlapping" design nozzles are placed in a straight-line arrangement, providing overlapping agent discharge patterns. This creates a virtual fire-free zone where appliances of various types and sizes are protected, even if they are replaced or rearranged under the hood.

Agent Selection

Until the early 1990s, the predominant fire suppression agent for kitchen systems was dry chemical powder. However, with the advent of UL 300 this has been superseded by higher-performing wet chemical systems. Indeed, I believe it is correct to state that no dry chemical systems have ever passed the UL 300 testing standard.

The most advanced wet chemical suppression agents used in pre-engineered kitchen fire suppression systems are designed to ensure vapour containment and cooling of the cooking appliance, plenum, and ductwork areas to help prevent re-ignition after initial flame knockdown. These advanced formulations quickly knock down flames and cool hot surfaces, while generating a robust vapour-securing blanket that helps prevent re-ignition. A bonus is that, with a nearly neutral pH, this suppressant is exceptionally friendly to cooking equipment and does no harm to stainless steel surfaces.

By definition a tailored, bespoke or engineered solution cannot undergo any performance testing regime; performance can be substantiated only by theoretical calculation and so cannot possibly be claimed to comply with UL 300.

Portable Suppression

Agent selection is equally important when considering portable hand-held extinguishers, due to the nature of Class F fires that involve cooking oils and fats such as olive oil, maize oil, sunflower oil, lard and butter.

Portable extinguishers perform a valuable "first line of defence" role in achieving fire safety in kitchens and, like fixed kitchen fire suppression systems, have a number of regulations and standards to which they must comply. These include: AS/NZS 1850: 2009 (Portable fire extinguishers – Classification, rating and performance testing); AS 2444: 2001 (Portable fire extinguishers and fire blankets – selection and location); AS/NZS 1841.1: 2007 (Portable fire extinguishers – general requirements); AS/NZS 1841.3: 2007 (Portable fire extinguishers – specific requirements for wet chemical type extinguishers); and UL 300, which stipulates that a Class K portable – the US classification for Australia's Class F – fire extinguisher is now required in all commercial kitchens. APF

Bob Grieve is Managing Director of Delta Fire Australasia

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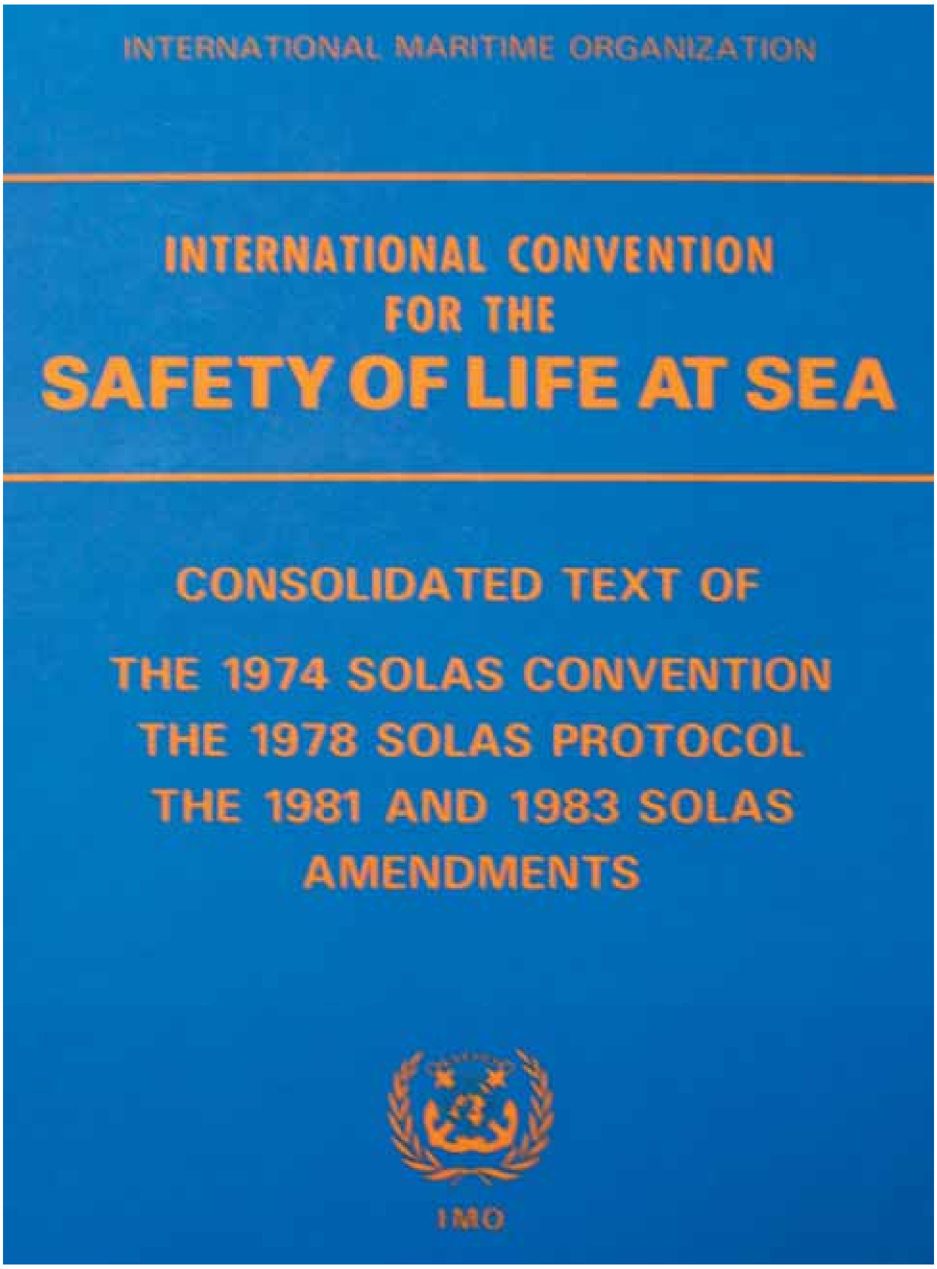
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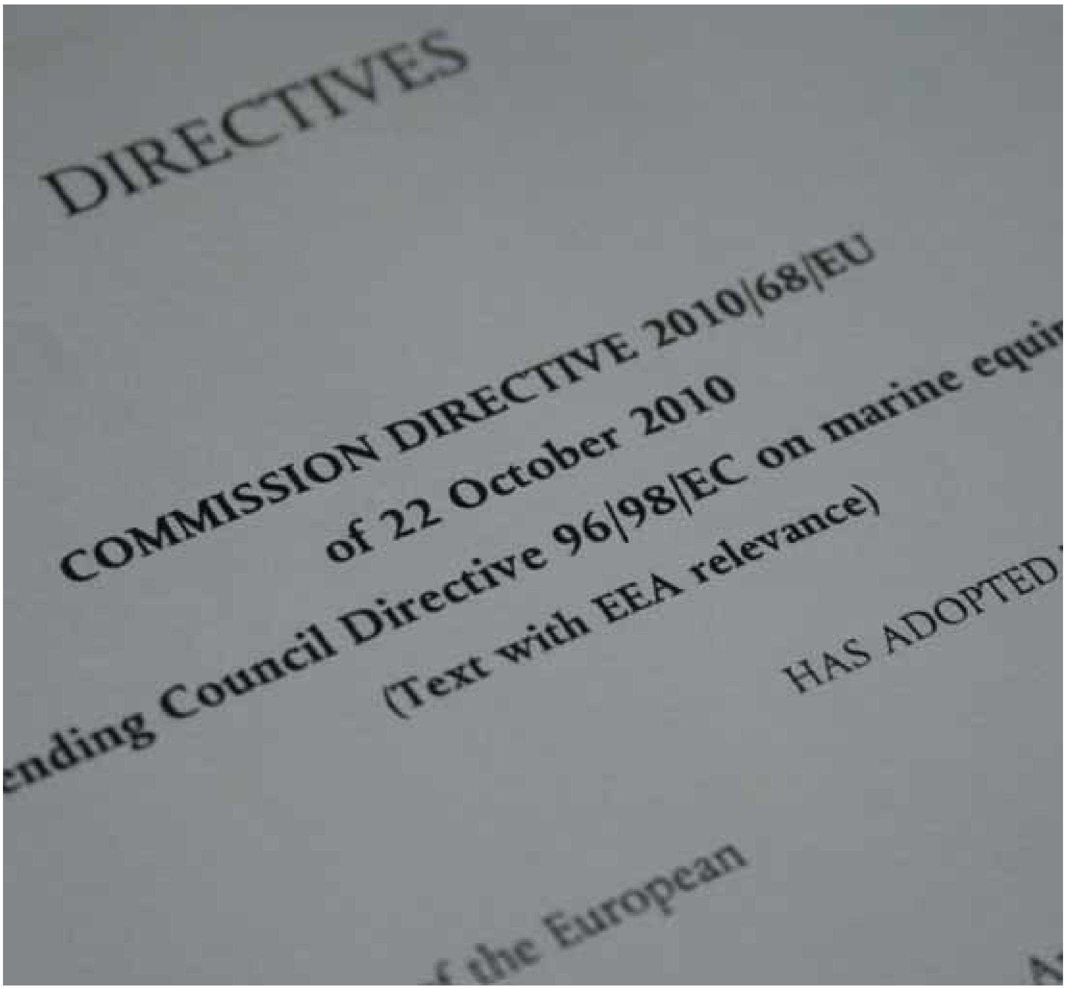
Safety at Sea

Despite the existence of marine safety standards since 1914, it is only in recent years that fire has been addressed in the regulations.

In the modern era, safety at sea has become a well regulated, internationally recognised aspect of all forms of marine activity. For many years, until the seas and oceans became the location for many forms of economic activity, safety was largely confined to protecting human life aboard ships. Today, throughout the world, marine activities include fixed and floating rigs and platforms associated with gas, oil and other mineral exploration and extraction both on the sea bed and in deposits of valuable hydrocarbons and minerals well below the ocean floor. This activity now extends well beyond coastal waters into the deep oceans as well as below the ice in Polar regions.

The origins of marine safety standards date back to 1914 when the first SOLAS (Safety of Lives at Sea) Convention was held in response to the Titanic disaster of 1912. For the next 60 years, subsequent SOLAS Conventions in 1929, 1948 and 1960 continued to focus on improving the design, materials and construction of vessels. Fire safety requirements were minimal and certainly were inadequate for passenger ships.

It was not until 1974, following that year's SOLAS Convention, that the first references to fire extinction were embodied in new regulations in a new chapter II-2 which specifically covered fire protection, fire detection and fire extinction which



DIRECTIVES

COMMISSION DIRECTIVE 2010/68/EU
of 22 October 2010
ending Council Directive 96/98/EC on marine equi
(Text with EEA relevance)

HAS ADOPTED

f the European

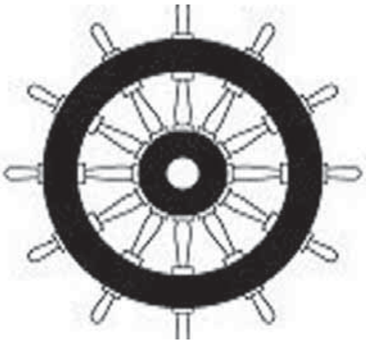
came into force in May 1980. Even at this point, reference to firefighting was limited to broad considerations of the means of containment and extinction of any fire in the space of origin and protection of the means of escape or of access for firefighting purposes.

It is less than 10 years ago that specific regulations were introduced into the 2002 revision of the 1974 Convention. In July of that year detailed regulations relating to marine firefighting were embodied in a much-expanded chapter II-2 that incorporated a part C covering the suppression of fire and, within it, Regulation 10 on firefighting.

Within this regulation (section 10) on firefighters' outfits, requirements are set out as to the mandatory minimum levels of on-board equipment including types of firefighter clothing, number of ensembles required according to the type of vessel and their storage. It is worth noting that obtaining buy-in to international regulations that require the adoption of such a wide range of basic principles and practices is a lengthy process but that, by 2002, the 1974 Convention, along with its various amendments, had been ratified by 141 countries representing over 98 percent of world merchant shipping tonnage.

The IMO (International Maritime Organisation) has its origins in 1948 when it was set up by the United Nations as a specialised agency with responsibility for the safety and security of shipping and the prevention of marine pollution by ships. The SOLAS treaty was adopted by the IMO in 1968.

Different standards apply in different parts of the world. At the present time, Europe is regulated by the Marine Equipment Directive (MarED) (the EU's Council Directive 96/98/EC on Marine Equipment) and is the group which coordinates the various Notified Bodies assigned by European Union member states to carry out conformity assessment procedures enshrined in the MarED. This procedure confirms that the equipment has been type tested and approved, which authorises the manufacturer to affix the mark of conformity (wheelmark) to the equipment. This is recognised across Europe.



In the USA, standards are provided by the US Coast Guard (USCG).

In 2004, the European Community and the United States signed a Mutual Recognition Agreement (MRA) on marine equipment, under which designated equipment certified as complying with the Marine Equipment Directive (MarED) 96/98/EC

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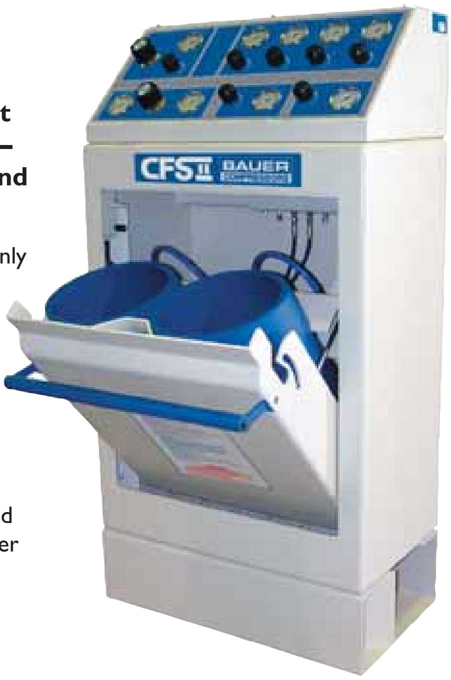

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would be accepted for sale in the US without the need for additional testing or certification and vice-versa. This agreement aims to simplify matters for manufacturers that wish to have both MarED certification and USCG type approval, allowing them to reach multiple markets on the basis of compliance with one set of regulatory requirements instead of multiple ones, leading to a reduction of costs in terms of testing and certification. This MRA does not currently extend to include firefighter PPE.

In Australia, the Australian Maritime Safety Authority (AMSA) represents Australia at the IMO and, for the most part, adopts IMO regulations and standards for its own shipping and marine regulatory frameworks. In relation to fire safety, it adopts the standards requirements set out in Chapter II-2 of SOLAS which were most recently adopted in November 2009 under its Maritime Orders Part 15 (issue 5) which covers fire protection, detection and extinction.

The first standard to be adopted by the IMO relating to 'Clothing to protect against heat and flame', commonly used for marine firefighting, was in 2008 embodied in standard EN ISO 11612:2008 (superseding ISO 11612:1998) which was itself based on the earlier European Standard EN 531:1995 'Protective clothing for workers exposed to heat'. This standard was part of a set of three that related to different industrial activities in which workers are exposed to various forms of heat and flame.

> **In Australia, the Australian Maritime Safety Authority (AMSA) represents Australia at the IMO and, for the most part, adopts IMO regulations and standards for its own shipping and marine regulatory frameworks.**

EN531/EN ISO 11612 requires the use of FR fabrics or clothing which neither ignites nor forms a hole or melts when exposed to flame. This standard also has various levels of heat transmission protection from potential burn injury. The highest level, normally used in marine firefighting clothing, requires a multilayer PPE construction. A number of modifications were made during the three years taken to draft EN ISO 11612 from EN 531. These included gaiters in addition to coats, trousers and hoods as well as test methods for performance requirements, which were introduced for tensile, tear and burst strength. Tests for seam strength and seam flammability were also included.

Firefighter clothing standards can appear quite complex, particularly given the different regulations that apply around the world. Some harmonisation has been achieved through the mutual recognition agreement between MarED and the USCG. The IMO and SOLAS regulations are widely used by many countries around the world as reference points for their own marine safety regulatory frameworks.

Within the MarED, confusion was created in 2009 when, in Annex A on firefighter close proximity protective clothing, changes in the 4th amendment (2008/67/EC) had the effect of requiring firefighters to meet either EN 1486 *and* EN 469 *and* EN 531 (EN ISO 11612) or ISO 15583 on its own. This complication, which had not existed in previous iterations, was carried through into the 5th amendment (2009/26/EC), which became effective in April 2010 and remains in force, making it officially impossible to certify firefighter clothing to the MarED using EN 469 alone.

Fortunately this difficulty will be resolved in the 6th amendment (2010/68/EU) when it comes into force in December 2011. This will allow certification by any of the three standards depending on the type of PPE involved. Progress towards this outcome has been helped by the recent certification by a German Notified Body of firefighter clothing using EN 469 only, well in advance of the implementation of the 6th amendment. This has now been deemed as acceptable to the European Maritime Safety Agency (EMSA) responsible for the application of the directive, effectively allowing it to be used for PPE testing purposes across the EU ahead of the planned December implementation.

The most recently published EU Commission Directive 2010/68/EU amends the previous marine equipment CD 96/98/EC and in Section 3, on fire protection equipment, sets out the standards required for firefighters' outfits including close proximity PPE, boots, gloves and helmets. In summary, the requirements are:

Protective clothing for firefighting (A.1/3.3)	**EN 469 (2005)**
Reflective clothing for specialised firefighting (A.1/3.3)	**EN 1486 (2007)**
Protective clothing with a reflective outer surface (A.1/3.3)	**ISO 15538 (2001)**
Boots (A.1/3.4)	**EN ISO 20344 (2004)** and **EN ISO 20345 (2004)**
Gloves (A.1/3/5	**EN 659 (2003)**
Helmet (A.1/3.6)	**EN 443 (2008)**

A new international standard has recently been developed and was published in June this year. The new standard, ISO 22488:2011 [Ships and marine technology – shipboard firefighters' outfits (protective clothing, gloves, boots and helmet)], has drawn substantially on the work undertaken for the recently issued European Standard. Organisations involved in the committee responsible for drafting this new standard, SME/32/-/1 Life-saving and fire protection, include the British Marine Federation, International Lifesaving Appliance Manufacturers Association (ILAMA), Society of Maritime Industries, Lloyds Register and the Maritime and Coastguard Agency. It is likely to be at least two years until this standard appears in a revised draft of the European Directive and cannot, therefore, yet be adopted by members of the EU.

The jurisdiction of various marine safety regulatory bodies referred to in previous sections only extends to shipping. Fixed and floating structures at sea, such as oil and gas exploration structures and production platforms, are separately regulated by national health & safety bodies. **APF**

Ivan Rich is Technical Manager at Bristol Uniforms

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POWER: 6,6 Kw
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DRY WEIGHT: 125 Kg / 275 lbs

MCH-6/SH

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CHARGING RATE:
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POWER: 3,5 Kw / 5.5 Hp
DIMENSIONS:
HEIGHT 35 cm / 13.7",
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LENGTH 78 cm / 30.7"
DRY WEIGHT: 38.5 Kg / 85 lbs

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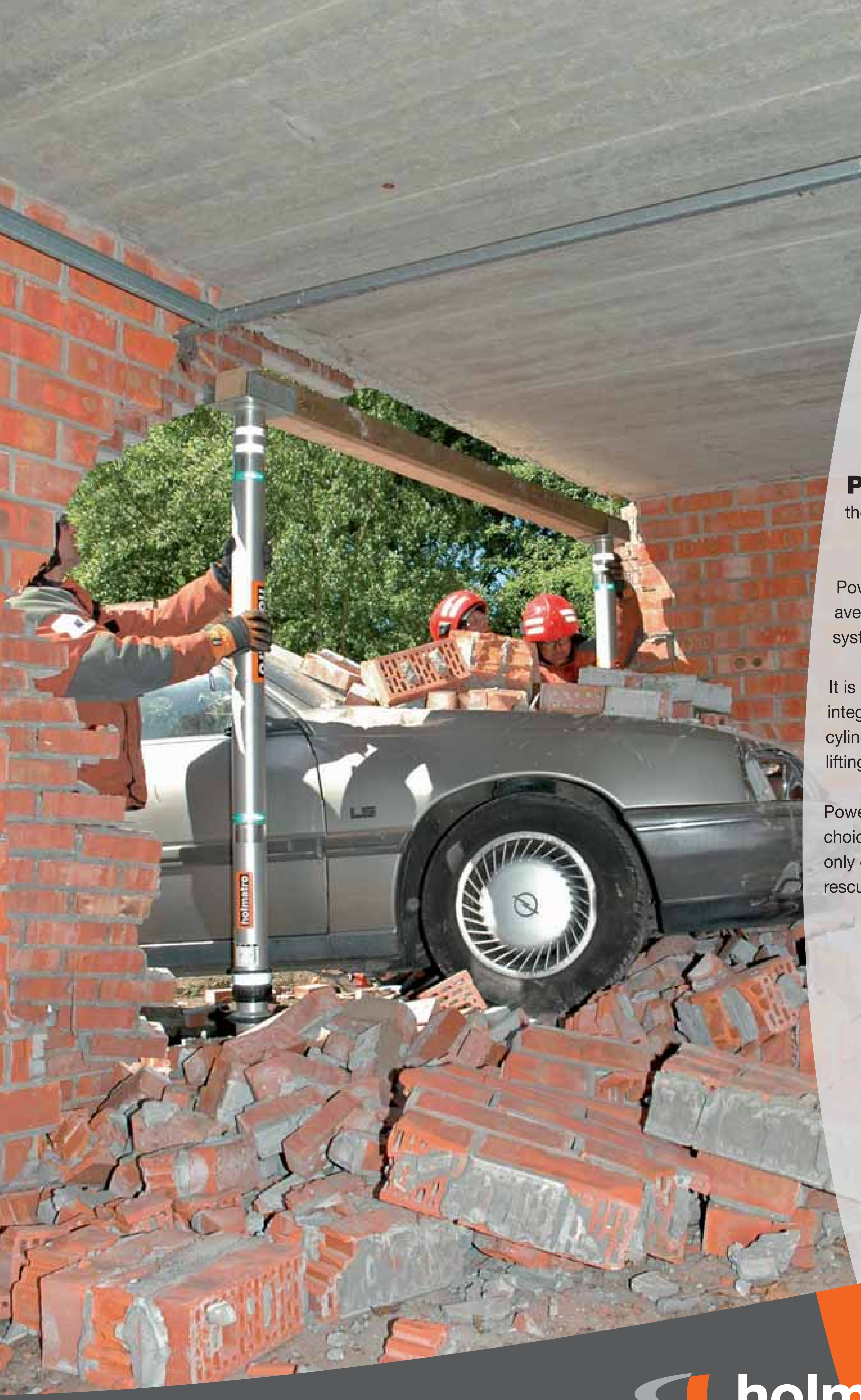

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Battery Combitool operating in sewer

Confined Space Rescue: How ready are we?

Ian Dunbar

Holmatro Rescue Equipment

"Confined Space" refers to a space which by design has limited openings for entry and exit, unfavourable natural ventilation that could contain or produce dangerous air contaminants, and which is not intended for continuous employee occupancy.

The dangers of working in confined spaces were written about nearly 2000 years ago during the time of the Roman Emperor Trajan. He sentenced criminals to work in the sewer as punishment and the ill effects were noticed by the physicians of the day. In the middle ages, German scientist and scholar Georgius Agricola noticed that stagnant air in mines caused severe respiratory problems and in 1925 American toxicologist, Alice Hamilton, wrote that decomposition of organic matter produces hydrogen sulphide, noting this often proved deadly in confined spaces such as vats, tanks and manholes. So bearing in mind we have had two millennia to prepare for confined space rescue, just how ready are we?

Research carried out in the USA in the 1980s and 1990s would suggest that maybe we have not come as far as maybe we should have done. A US Department of Health and Human Services study, published in 1994 described 585 separate incidents leading to 670 fatalities (1980-89). Another study looking at confined space deaths from 1983-1993 reports the far more worrying statistic that of the 109 fatalities involved in confined space incidents, 39 (36 percent) were rescuers themselves.

Thankfully, the last 25 years has seen huge advances in search and rescue equipment and techniques coupled with greatly improved health and safety at work legislation, which has resulted in a reduction in the number of fatal incidents recorded. Despite this downturn, this type of incident still occurs more frequently than we would like, and for that reason we have to be prepared. We need to have mechanisms in place that allow us to react to such incidents and ensure a successful outcome.

Specialist Type of Rescue

Confined space work is still an element of technical rescue that is not widely practiced and does tend to be a specialist role (usually within the spectrum of urban search and rescue techniques) requiring additional skills and equipment. The

Hand-operated Power Wedge combines extremely small insertion height with more than 25 tonnes lifting capacity

dilemma facing rescue providers around the world is that because the window of opportunity for rescue is so very small, how do you ensure adequate and timely provision of resources?

Of course, if every team that worked in confined spaces was self-sufficient in terms of rescue capability, this would go some way to relieving the burden on local first responders, but this is very rarely the case.

Hazards

There are two main hazard categories that can be associated with confined space work (and therefore rescue). The overview below details the main elements of the two categories:

Atmospheric hazards

- Oxygen deficiency.
- Oxygen displacement.
- Flammable atmospheres.
- Toxic Gases.
- Solvents.

Physical hazards

- Engulfment in loose material.
- Electrical/Mechanical machinery.
- Falling Objects.
- Temperature Extremes.
- Noise Exposure.
- Wet/Slick surfaces.

Practical problems

Civilian work in confined spaces is now heavily regulated due to the hazards listed above. Emergency response into these areas also has to take account of these hazards. In addition to this, rapid access, travel, location treatment and packaging of casualties and swift exit, all have to be done in very difficult and challenging circumstances. All of the elements of rescue we take for granted 'above ground' are now compromised. No longer do we have unrestricted movement, a breathable atmosphere, clear communications and a wide selection of equipment, suddenly everything has changed.

Casualty considerations

Once the personal safety of the rescue team has been established, the focus then turns to the casualty. As with any other type of rescue, you must obtain as much information as possible regarding the mechanism of injury. This ensures that the team is adequately protected and does not fall foul of the same problems and also allows you to plan your extrication method prior to entry.

If your casualty is conscious, breathing and is able to answer your questions, this is an excellent source of information (and also gives an excellent indication of a patent airway, breathing, circulation and neurological status). However, an unconscious casualty means you have to rely on other information sources. No one working in a confined space should be working alone, and colleagues above ground should be able to provide you with more information.

Knowing where the casualty was working, his or her task, how long trapped or injured and any medical history will allow you to best plan ahead. With this information you can choose the appropriate extrication methods and relevant equipment before committing, saving vital time later in the rescue. Remember, the "golden hour" still applies, so the minimal medical intervention followed by rapid extrication is what will give your casualty the best chance of a favourable outcome. Prior knowledge of the relevant injuries and medical conditions associated with confined space work, will also allow you to assess and extricate your victim in the most appropriate time.

Training

We need to understand that confined space rescue is a high risk, low occurrence event. It is fair to say that we feel more confident at tackling the low risk (relatively speaking), high occurrence

Battery Combitool going down sewer

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Hand-operated Combitool used in confined space

events such as road rescue. Simply put, the more of one type of incident we attend, the more capable we become. We should always identify these types of occurrences and design our training accordingly. Too many rescuers have become victims of confined space incidents and the inability to identify hazards and control the risks have contributed to the vast majority of these deaths.

Approach to confined space rescue will vary across the world. There will be different levels of resources in terms of team members and equipment. Also local, regional and national guidelines will dictate what your standard operating procedures are. The analysis of your local risks should be the starting point for your preparation, as this knowledge will allow you to specifically ensure to have the right equipment to deal with any eventuality you foresee.

The intervals at which you train are also very important. A lot of research has been done into the subject of skills fade. Some studies suggests that more complex tasks, requiring analysis and decision making requires a different approach to simple repetitive practice, and it is important to increase the understanding of the underlying principles involved.

Equipment

There was a time when rescuers had a small inventory of tools that had to be used for all manner of applications at operational incidents. The nature of rescuers means that problems are very quickly overcome and, in fact, tools were modified to make them more suitable for a wide range of uses.

One result of this inventiveness is that it has largely paved the way for the tools we have available today. Tools that are not only modified, but actually designed and constructed with the sole intention of working in confined spaces, allowing rescuers to overcome some of the practical problems and hazards involved.

Self-contained Tools

Above ground in open, well lit, well ventilated and spacious areas, conventional tools (hydraulic rescue tools with hose and pump) will always be the number-one choice for rescuers throughout the world. The use of single-hose technology and couplings that allow tools to be changed under flow has greatly assisted emergency responders in reducing extrication times and making the process safer and easier. For some confined space rescues this equipment may well be your first choice. However, in the vast majority of cases, certainly where deeper penetration is required, we have to look for alternatives.

Confined space rescue does not permit limitless resources. Entry of rescuers into the affected area will be limited, for obvious reasons. This limit of personnel also means there is a physical limit to the amount of equipment that can be taken. So the equipment has to be really compact, light, well designed and easy to use. Ironically, the equipment required at these types of incident tends to be bigger and bulkier than its above ground equivalent.

For that reason, the development of self-contained tools means that you now have the possibility to lift, cut and spread in confined spaces using tools that are small, light and compact, with no need for a separate pump and hose. This type of tool can be split into two categories: Hand-operated and battery powered.

Hand-operated cutters, spreaders and wedges have and integral two-stage pump that requires relatively little force to operate. The fold away handles are rotatable through 180 degrees and can be used in any position and adjusted at any time, even during use, when the tool is under pressure. Despite the fact that they are hand controlled, they still operate at 720-bar and have impressive lifting, cutting and spreading forces.

Battery operated tools are excellent for rapid intervention during remote and confined space work. Light (15 kilograms) and compact, they offer the rescuer further options. Remember, both hand-operated and battery tools that are equipped with integrated LED-lights greatly improve visibility and improve safety. These tools also come with straps and harnesses to make transportation and operation even more user friendly.

Remember the value of pneumatic equipment at incidents in confined spaces. For example, high pressure airbags capable of lifting five tonnes weigh as little as two kilogrammes and give a lift/spread of 150mm.

Conclusion

The risks of working in and rescuing from confined spaces are well known and well documented and for this reason, this type of incident is foreseeable. Despite advances in safety, dedicated tools and improved techniques, the nature of this type of environment means that your skills, equipment and resources will be severely tested and your casualty still requires rescue in a safe timely manner, in line with the "golden hour".

As with any kind of rescue scenario, preparation is your strongest weapon if you are to overcome the hazards and risks involved. Training at regular intervals, choosing equipment that is specifically designed for this purpose and having the underpinning knowledge is the only way to manage the risks associated with confined space rescue, and ensure you do not become another statistic. **APF**

Ian Dunbar is Rescue Consultant at Holmatro Rescue Equipment

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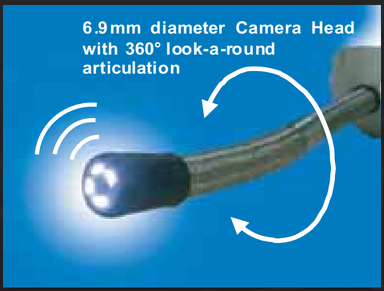

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A New Era in Road Tunnel Safety

Pasi Vuolle

Marioff

Tunnel fires pose not only a life safety threat for travellers; they can also cause severe damage to the tunnel including the concrete construction and mechanical and electrical systems.

In confined underground spaces such as road tunnels, fires are particularly dangerous because they can grow extremely quickly, generating very high temperatures and amplifying the dangers posed by fuel spills and toxic smoke. These phenomena can prevent emergency services from approaching a fire to fight it and have led to several casualties in tunnel fires around the world.

Tunnels are traditionally protected against fire by passive safety measures. These measures include construction materials that inhibit the spread of fire and safety structures such as special escape tunnels, emergency exits to a neighbouring tunnel or to the surface, and spaces where people can find shelter. Passive safety measures contribute to underground safety in important ways, but can prove insufficient during major fires.

In the search for solutions that better mitigate the threat of underground fire, experience drawn from fire testing and field installations shows that high-pressure water mist technology is an excellent solution for preventing direct and consequential damage to people, tunnel infrastructure and traffic. An increasing number of high-pressure water mist systems are being installed around the world to protect underground transportation infrastructure such as road tunnels. In this environment water mist systems attack fire instantly upon activation, suppressing and controlling the fire before it can spread with minimal amounts of water.

Water mist systems use plain water and are therefore environmentally safe. These systems use substantially less water than conventional deluge systems, a great advantage in underground environments where water supply and drainage can be problematic.

High-pressure water mist fights fire using three main mechanisms: cooling the fire itself and the air surrounding it, blocking the radiant heat, and displacing the oxygen. The small water droplets vaporise very quickly, absorbing heat very efficiently. At the same time, the water mist expands, displacing the oxygen at the seat of the fire. The water mist blocks effectively the radiant heat, preventing the fire from spreading or reigniting.

As one of the world's leading suppliers of water mist fire protection systems, Marioff has delivered its HI-FOG water mist fire protection system to a number of operators of underground facilities.

High pressure water mist discharge

The World's Largest Fixed Fire Protection System in Road Tunnels

The A86 West tunnel in Paris, protected by a high-pressure water mist system, is probably the world's largest road tunnel protected by an active fire protection system. This tunnel is a feat of engineering and design at ten kilometres long with two superimposed levels, one in each direction. Each level has two traffic lanes and a hard shoulder. Reserved for light vehicles, the tunnel is equipped with all the latest safety devices, exceeding the requirements of new French regulations governing tunnel safety.

The importance of fire protection is magnified in this type of tunnel, designed to carry very dense traffic. The ceilings are very low; it may be difficult to evacuate even small volumes of smoke. The heat given off by a fire will also quickly affect the low-lying ceiling equipment.

The water mist system provides front-line fire protection with a clear mission in case of fire. The system must reduce the ambient temperature, facilitating the evacuation of motorists to the emergency exits located at 200-metre intervals. It must also reduce moderate conditions for emergency services arriving on the scene, allowing them to contain, control and extinguish the fire.

The water mist system carries out its mission with 24 spray heads for each coverage zone, each of which is 33 meters long. Three zones are triggered simultaneously in order to cover an area about 100 meters long around the seat of a fire. Upon activation, the water mist rapidly absorbs heat, giving very effective cooling. This also greatly reduce the amount of smoke a fire gives off and contributes to safe evacuation and saves lives during the first critical moments of a tunnel fire.

HI-FOG spray head for tunnel fire protection, with assembly body and protective cap

Madrid's Modern Urban Traffic Management

The Madrid M30 project is the world's largest urban tunnel project, involving 99 kilometres of new road construction, 56 kilometres of which are tunnels. The project covers the redesign, rerouting and refurbishing of the inner ring road of the city of Madrid. Over a number of phases, the M30 project has been rerouting major sections of the road through new tunnels, freeing up surface areas for redevelopment into green areas, footpaths, bicycle paths and new housing, while significantly reducing inter-city travel times.

At the project planning phase, seven tunnel segments were identified as requiring an active fire protection system. A number of different water mist systems were subject to full-scale fire testing. The results convinced the road authority that it was possible to design and build a water mist system to handle the M30's extra-wide tunnel sections and potentially large fire loads (heavy goods vehicles) while using modest amounts of water when compared with traditional deluge systems. The seven tunnel segments designated as requiring active fire protection are now protected by water mist systems.

Helsinki Service Tunnel

The Helsinki service tunnel was built between 2007 and 2010, and is protected by Finland's first automatic tunnel fire protection system. The total length of the new tunnel is two kilometres. This tunnel is the main thoroughfare for goods vehicles carrying supplies to stores and shops downtown. Getting delivery vehicles off the streets had a direct positive impact on city traffic and air quality.

The tunnel is the most complex underground construction in Finland; the average height of the tunnel is 5.5 meters and the width varies from seven metres to 20 metres. It has two-way traffic, connections to several other infrastructure projects, underground crossings including four roundabouts, all on average 30 metres to 40 metres below ground. It was a considerable technical challenge to implement the water mist

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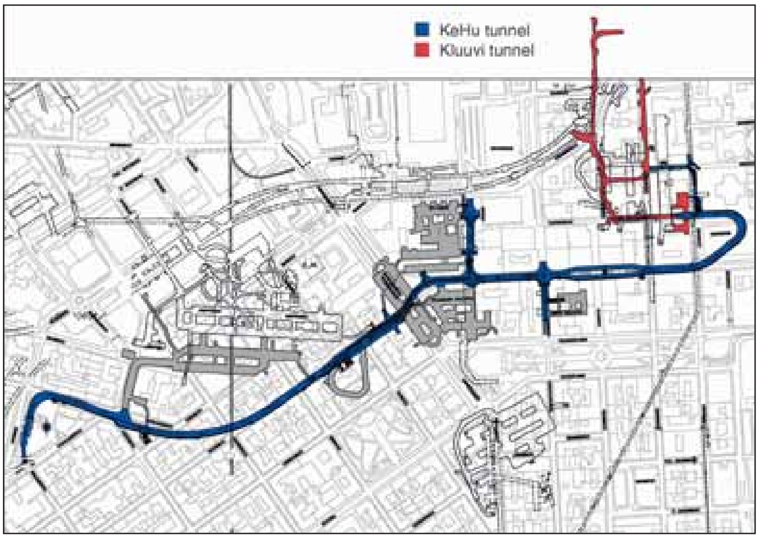

The fully automatic fire protection system in Helsinki service tunnel, which runs straight under the city centre

system zone sizing. The design had to take into account the complexity of the tunnel while maintaining the required performance together with the ventilation and fire detection systems.

The water mist system is designed to discharge simultaneously over two 25-metre long zones. The system flow rate is secured by three large pump units driven by diesel engines. The flow rate of each pump is 1200 litres a minute; two of them are required to operate simultaneously with the third for back-up. The back-up pump unit can be deployed to add flow rate, covering larger areas if needed. Water for the water mist system pumps is supplied from two separate sources: a main city sprinkler feed and a water reservoir located close to the high-pressure pumps.

Water mist's excellent cooling capability is considered to be an essential advantage. In tunnels, if there is no fire suppression system to provide cooling, firefighters cannot get close enough to fight the fire effectively with fire hoses. Furthermore, experience gathered from full-scale tunnel fire tests showed that the velocity of the longitudinal ventilation during a water mist discharge can be less than when water mist is not being discharged. This helps the fire brigade approach the fire scene safely from the upstream side – they will not be impeded by a loss of visibility.

The climate in, for example, Finland can be extremely cold during the winter, so thermal protection is needed for the water mist system tubing. A trace heating system was installed for the main tubes exposed to low temperatures. Roads in Finland are also treated with salt to prevent icing during winter. All tubes and components are made of high-grade stainless steel in order to ensure the best protection against corrosion in aggressive tunnel environments. This will naturally prolong the life-time of the water mist system.

Two options were originally considered for protecting the tunnel: conventional sprinkler systems and water mist. The lower water consumption of water mist combined with its excellent heat and smoke suppression meant that there would be considerable savings in other systems. The drainage system could be more compact, the water supply and input/output channels smaller, the ventilation system could be smaller, and instead of multiple pump stations, a single, large pump station could serve the entire tunnel. The total amount of water needed for a conventional sprinkler system would have meant much larger tanks and water collection reservoirs. It also would have been very difficult for the city's water supply to feed a conventional sprinkler system. These are all clear cost-cutting benefit compared with conventional deluge systems.

In the final phase of the service tunnel project, the 25-year-old Kluuvi tunnel was connected to the new tunnel. The old Kluuvi tunnel had an aging sprinkler system that was not dimensioned according to area discharge, but rather relied on traditional glass bulbs breaking. Fire in this old Kluuvi section was a major risk for the stores connected to the tunnel, some of which do not yet have modern fire doors. It was decided to extend the water mist system into the Kluuvi section to ensure the entire tunnel has the same level of protection. The existing water mist system of the new tunnel was easy to extend to this old tunnel area using the same pump room.

Water Mist Named in New Australian Standard

Improving safety in underground infrastructure is a worldwide effort bringing together scientific research, government authorities and private sector businesses.

A new Australian Standard, AS 4825-2011 Tunnel Fire Safety, was published earlier this year in response to the increasing number of road tunnels being built in Australia. Significantly, this new Standard recognises water mist systems as a legitimate option to conventional sprinkler or deluge systems. While conventional tunnel sprinkler and deluge systems have typically been designed on the basis of historically-derived water application densities rather than tunnel specific fire test programs, the effectiveness and performance of water mist systems in tunnel applications is documented and proven in full scale tunnel fire tests. **APF**

Spray head system installed in roundabouts in Helsinki service tunnel

Pasi Vuolle is Manager, Tunnels, Global Business Development at Marioff Corporation

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Pic courtesy DirectNIC.com

The Industrial Building Fire Challenge

Graham Collins

The consequences of a major industrial fire can be catastrophic, potentially impacting on the business' ability to survive, workforce safety and employment, the local environment and the surrounding community.

Industrial premises come in a wide variety of shapes and sizes and cover everything from the smallest traditional engineering workshop to the latest cutting-edge, hi-tech production facility. They can range from a relatively low fire load, low risk one-man operation to the massive high-hazard chemical and petrochemical complex. Some have a fast turnaround of goods with little inventory, while others demand the storage of highly flammable fuel, raw materials and finished goods. Not all operate within the conventional nine-to-five timeframe; some are in action around the clock whereas others have automatic machinery that is in unmanned "lights out" operation. Even the fire load can vary in some industrial premises, particularly those involved in manufacturing and storing seasonal goods.

If that is not enough to contend with, while industrial buildings around the world have been constructed to comply with a variety of building codes and standards, older buildings that were constructed long before today's regulations and codes of practice are still commonplace in many countries. The result is that industrial buildings can still be found that are built to less stringent standards than those in force today, with a degree of fire protection, compartmentation, fire stopping, fire detection and fire suppression that would be unacceptable in industrial premises built today. They frequently also utilise materials that are no longer acceptable. This includes asbestos and cladding and lining materials with unacceptable spread of flame or other fire performance characteristics.

The problems associated with these older industrial buildings are compounded by three other factors. Many are now used for purposes other than those originally intended, and possibly without approval for their change of use; they may well contain substantially different fire loadings and risks than were originally anticipated; and may now have environmental or neighbouring challenges that did not exist when the premises were originally built.

New methods, new challenges

Manufacturing, assembling and warehousing are today highly automated operations where the philosophy is often to achieve the maximum stockholding in the minimum space; to make every square metre of space earn its keep. High-level – sometimes floor the ceiling – racking and access gangways so narrow that fork-lift trucks and side loaders completely block the gangway are the norm.

Companies involved in the manufacture or distribution of seasonal or fast-turnaround stock run the risk of using every conceivable space for storage without sufficiently considering the implications for the safe evacuation of employees in a fire, or the safety of the emergency services tackling a blaze as a result of blocked access or evacuation routes. Storage can also be allowed to spill over into adjoining areas during periods of peak demand, utilising forecourts, yards and loading bays.

But, it is not just the increased density of goods that needs to be assessed. Attention also needs to be paid to the fire load characteristics of the stored goods. For example, highly flammable plastic shrink wrapping is now in widespread use, as is highly combustible cardboard and plastic packaging materials and plastic pallets.

These raise the question of fire risk assessments for industrial premises. While the need for them should by now be widely understood, the importance of treating them as an on-going activity may not be sufficiently appreciated by industry. Fire strategies for industrial premises need to be particularly robust and reliable, and the reality of the situation is that in industrial buildings where the volume of stock and its location change on a daily basis, a fire risk assessment needs to be undertaken at a matching frequency.

> **Risk assessments for any high-risk industrial site – particularly if it uses toxic, highly flammable or explosive substances – should not be limited to what might be described as “internal” fire safety threats and challenges.**

Empty building risk

The building owners’ responsibilities are not removed by virtue of the building being unused or unoccupied. Even if the building is properly decommissioned and mothballed; the owner or occupier still has responsibility for the maintenance of fire detection and alarm systems or fire suppression installations in as far as they safeguard maintenance or security personnel, or impact on the safety of firefighters who may be called upon to tackle a blaze in the empty building.

Very careful thought has to be given to fire safety precautions before shutting down existing fire detection and firefighting installations or cancelling maintenance regimes. Empty premises are also particularly prone to vandalism and arson, so effective security needs to be implemented to make sure that essential fire safety equipment has not been maliciously damaged or even stolen.

Neighbourhood assessment

Particularly in older premises, a fire can easily spread to adjoining premises, due to the poorer fire performance of the materials used for its construction or the closeness of neighbouring buildings. So, there is a strong argument for co-operating with the management of nearby industrial units to exchange information on fire safety precautions, potential fire risks, preventative measures and fire risk assessments. Adopting an integrated and co-ordinated approach with neighbouring sites, and sharing that information with the local emergency services may well pay huge dividends in the event of a fire.

Special risks

Whomever is responsible for undertaking the fire risk assessment, it is imperative that he or she has an intimate understanding of the special risks associated with industrial buildings in general and of the specific material, production and process risks and challenges of the particular site. These risk assessments must be carried out and regularly updated by competent specialists who can demonstrate experience in these often volatile and special high-hazard environments.

Risk assessments for any high-risk industrial site – particularly if it uses toxic, highly flammable or explosive substances – should not be limited to what might be described as “internal” fire safety threats and challenges. For instance, the responsible assessor needs to take into account what is going on beyond the site’s perimeter fence that might pose a fire risk: what spill-over risks do neighbouring properties and their processes pose, and how can these be negated.

Specific solutions

The type and complexity of the fire detection and alarm system and the provision of fixed fire suppression equipment will naturally vary from site to site, depending on many factors. Certainly, there is no shortage of reliable solutions on the market that adhere to the latest standards and codes of practice.

However when considering larger, more business critical or high risk industrial sites it is wise not to fall into the trap of believing that detection, alarm and suppression are all that need to concern the building owner. Frequently there is much more that needs to be considered. After all, the objective is to minimise the impact of a fire, and that may well mean not assuming that your responsibilities end with the arrival of the emergency services. The resources that are essential for the fire and rescue service need to be available at a moment’s notice. One example is fire hydrants. Not only do they need to be in the right places, the pressure at each hydrant needs to be tested regularly.

Testing is essential

Testing of fire preparedness in industrial premises is not merely a matter of routine maintenance of the detection and alarm system or the fire suppression equipment; it should embrace every aspect of the emergency and evacuation arrangements in as close to a real-life or worse-case scenario as possible. The reality of the situation is that, while you may only ever have one fire, it may turn out to be the organisation’s last. The statistics on business closures following a fire make sobering reading, and the life and property stakes are too high in these high risk environments to leave anything to chance. **APF**

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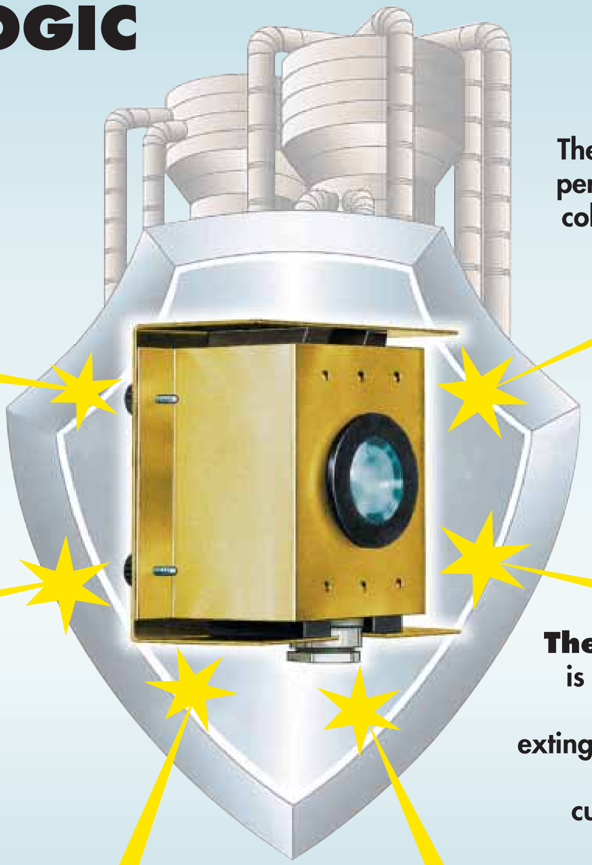

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Latest Developments in Fire Detection

Richard Bramham

Apollo Fire Detectors

The fire detection market continues to evolve in order to meet the needs and expectations of the end user.

As buildings become more sophisticated, fire detection technology must keep pace in order to continue to accurately and reliably provide warning of fire. One of the biggest challenges for fire detection product manufacturers is to predict what new technological demands will emerge, and to develop timely solutions for them.

It's Good To Talk

There is increasing demand for products that interact with one another without the need for specialist knowledge on the part of the user. People assume, with some justification, that if their mobile phone can talk to their home computer and car entertainment system then there should be no problem getting their security system and fire alarm system to work together as well.

Buildings today can have any number of systems installed in order to control security, heating, lighting and ventilation. Controlling all of these systems through a common interface would undoubtedly make life easier for the end user. Indeed, modern building management systems (BMS) have evolved to offer this level of integration. However, fire detection has resisted full integration to date.

There are good practical reasons for this; not least the fact that fire protection is a life-critical function. The possibility that a fire signal could be compromised by a fault in a lighting circuit is not an acceptable risk. Historically, legislation and guidance governing fire system design and installation has been more prescriptive than for other BMS functions. It has therefore been simpler to keep fire detection separate – although this situation is changing as pan-European legislation seeks to unify and update individual country's regulations.

In real terms, there is a lot to be said for closer interaction between fire systems and other building functions like heating, ventilation and lighting. Indeed, it can bring some positive safety benefits.

For example, the signal from a fire system could be used to tell the security system to release certain access doors in an emergency, or to page staff to enable them to respond appropriately when an alert has been raised. The aim would be to develop a means of facilitating greater integration between fire detection and other BMS functions without introducing more levels of complexity – either for the installer or the end user.

Apollo has been addressing the issues of integration and has come up with an answer called OpenConnect Gateway. This discreet device can be incorporated into a fire control panel and enables the information from a fire system to be communicated to a BMS (and vice versa) using standard protocols Modbus, BACnet and LonWorks. In essence, this allows the fire signals to be fully integrated with other BMS signals, but allows the fire detection wiring and devices to remain physically separate.

Making Improvements

Of course, not all market trends demand the development of a brand new product or technology; sometimes making modifications and improvements to existing fire detection devices can ensure that they continue to offer optimum value and reliability to the installer and the end user.

One continuing challenge is the adequate protection of large open internal spaces, such as sports halls, warehouses, hangars, theatres and churches. The detection method of choice for wide areas is beam detection. Essentially, these devices work by projecting a beam of light across the space and measuring how much light is returned to the sensor. Smoke particles disrupt the beam, reducing the amount of light being received. It is therefore crucial that the emitter and the receiver are correctly aligned to avoid false readings. This is not always easy to achieve – particularly at height.

Apollo has recently introduced an auto-aligning beam detector with laser alignment that helps to overcome this problem. It enables the installer to use a visible laser to align the beam initially, rather than relying on sight alone. The technology also includes an automatic, motorised auto-alignment feature to ensure that the beam remains on target. This feature compensates for minor adjustments and counters any building movement over time.

Technology and Training

Sometimes, improving fire detection requires a combination of better technology and improved skills. For example, there is an ongoing need to provide adequate fire protection in circumstances where hard wiring is either not possible or not desirable. This covers quite a number of scenarios; from historic buildings with delicate interiors to remote or temporary structures where hard wiring is impractical.

Wireless fire detection is ideal for these types of situations. Instead of communicating using electrical impulses sent down cabling, these devices transmit radio signals back to a receiver. Apollo's own wireless range, XPander, is designed to be used in conjunction with a standard fire detection system, in order to protect areas that require wireless technology.

XPander has recently been improved to make the technology even more reliable. The range has been extended to include an optical smoke detector, a multi-sensor smoke detector, heat detector types A1R and CS, a wireless base, a manual call point, a sounder and a sounder beacon and single and dual Input/output units.

Upgrading the technology is only part of the story. The ability of any fire detection device to function correctly is not reliant on good technology alone – it must be correctly specified and installed too. This is particularly important with wireless devices because they communicate in a very different way to hard wired fire detectors. Apollo therefore does not sell XPander to companies

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unless their installers have had suitable training. Apollo offers free training courses on XPander – and indeed all its other products – to improve reliability by ensuring that the technology is fully understood and applied correctly.

Improving Confidence

Having ensured that the right product is installed correctly and in the appropriate environment, it is important that end users have full confidence in their fire system throughout its lifetime. Apollo sees the issue of lifecycle costs as an area where knowledge within the fire industry is lacking, and has introduced a CPD-approved training course on this topic.

In addition, Apollo has taken the lead in introducing a product lifetime guarantee, which makes clear the life expectancy of Apollo products and is currently being rolled out worldwide.

At present there is no legal obligation to supply product lifetime information. BS5839, the industry code of practice, puts the onus on the manufacturer to define the working life of the product, along with requirements for servicing and maintenance. However, the amount of detail available can vary enormously from manufacturer to manufacturer.

The product lifetime guarantee provides a warranty on Apollo products, which for detectors is ten years (CO detectors, five years). It protects against the unlikely event of a manufacturing defect and is applicable when products are used in dry, non-corrosive atmospheres (provided that they are regularly inspected, tested and cleaned in accordance with Apollo guidelines). All products that were manufactured from 1st December 2010 onwards are covered by the new guarantee.

We hope that other manufacturers will follow our lead in making this simple piece of information much more transparent in future. The benefits to the industry in terms of improving reputation and customer confidence are significant.

Looking Forward

So, fire detection technology is continuing to evolve to meet the needs of the market. However, there is a limit as to how far any single technology can be progressed. Fire detection has historically relied on a very small number of sensing technologies; mainly ionisation, optical and thermistor (heat). It is likely that a major step change in technology will be required in order for the industry to develop in new directions. In light of this, Apollo is already looking to the future.

One avenue that is being explored is the adoption of sensor technologies that are currently used successfully in a variety of other industries. An example is chemical or semiconductor sensors, which have proven very reliable in other applications and particularly in the detection of toxic and combustible gases. If this technology could be transferred reliably to fire detection it could lead to the use of just one sensor type to identify a whole range of fires – a move that could revolutionise the industry. Because they respond to traces of gas, semiconductor sensors could pick up the products of combustion far earlier than traditional smoke and heat sensors, allowing more precious time for evacuation or remedial action.

With regard to general trends in fire detection, these continue to be driven by the desire to improve reliability and use technological improvements to deliver excellent customer service. In order to do so, specifiers and installers need to be able to respond quickly to new trends. We believe this is one of the reasons that open protocol fire systems will become the preferred choice in future.

Adopting an open protocol policy offers freedom of choice regarding sourcing products and which components are used, both now and in the future. This means that technology based on an open protocol is fully interchangeable, even if it is made by a different manufacturer. Forwards and backwards compatibility also means that an updated or new product can easily be added to an existing system at minimum cost and with minimum disruption.

Conclusion

When dealing with a safety-critical technology such as fire detection, it is crucial that the technology is reliable and accurate. As buildings continue to evolve, it is not only the fire detection that must keep pace. As an industry, we must ensure that skills continue to match the technology available: the best fire detection product in the world cannot work to its best if it is incorrectly specified, installed or maintained. Apollo therefore puts great emphasis on training and will continue to add new courses to cover any skills gaps.

Customers' expectations continue to rise. The fire industry therefore needs to ensure that it delivers. Added to the development of new, appropriate technology and relevant skills, we need to demonstrate flexibility and responsiveness. This cannot be achieved in an atmosphere of secrecy or by limiting ourselves to one product or manufacturer for the lifetime of a fire system. Apollo firmly believes that improvements are best made by being open, sharing information and allowing trained professionals responsible for system design, installation and maintenance the freedom to choose. APF

Richard Bramham is Marketing Director at Apollo Fire Detectors

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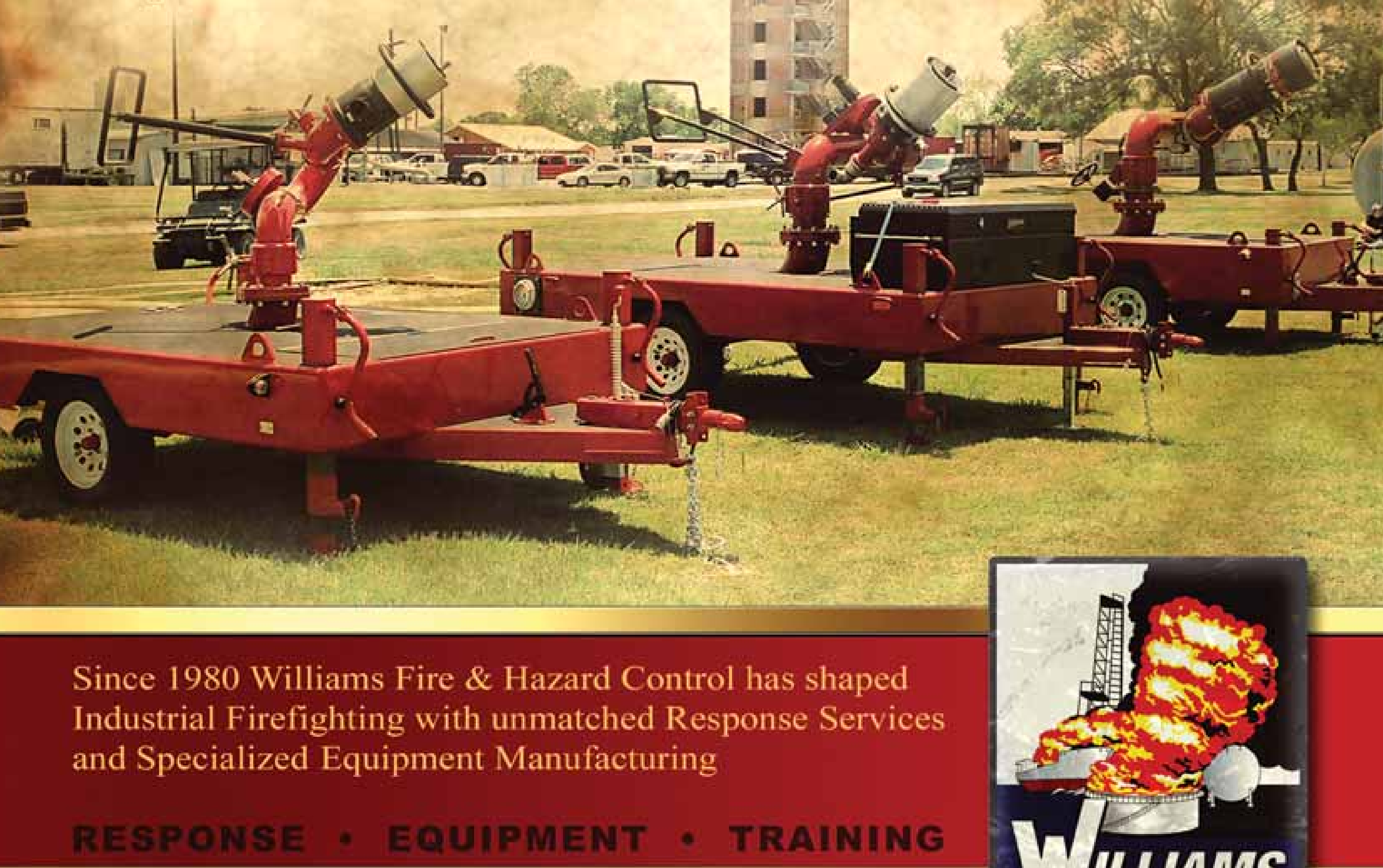

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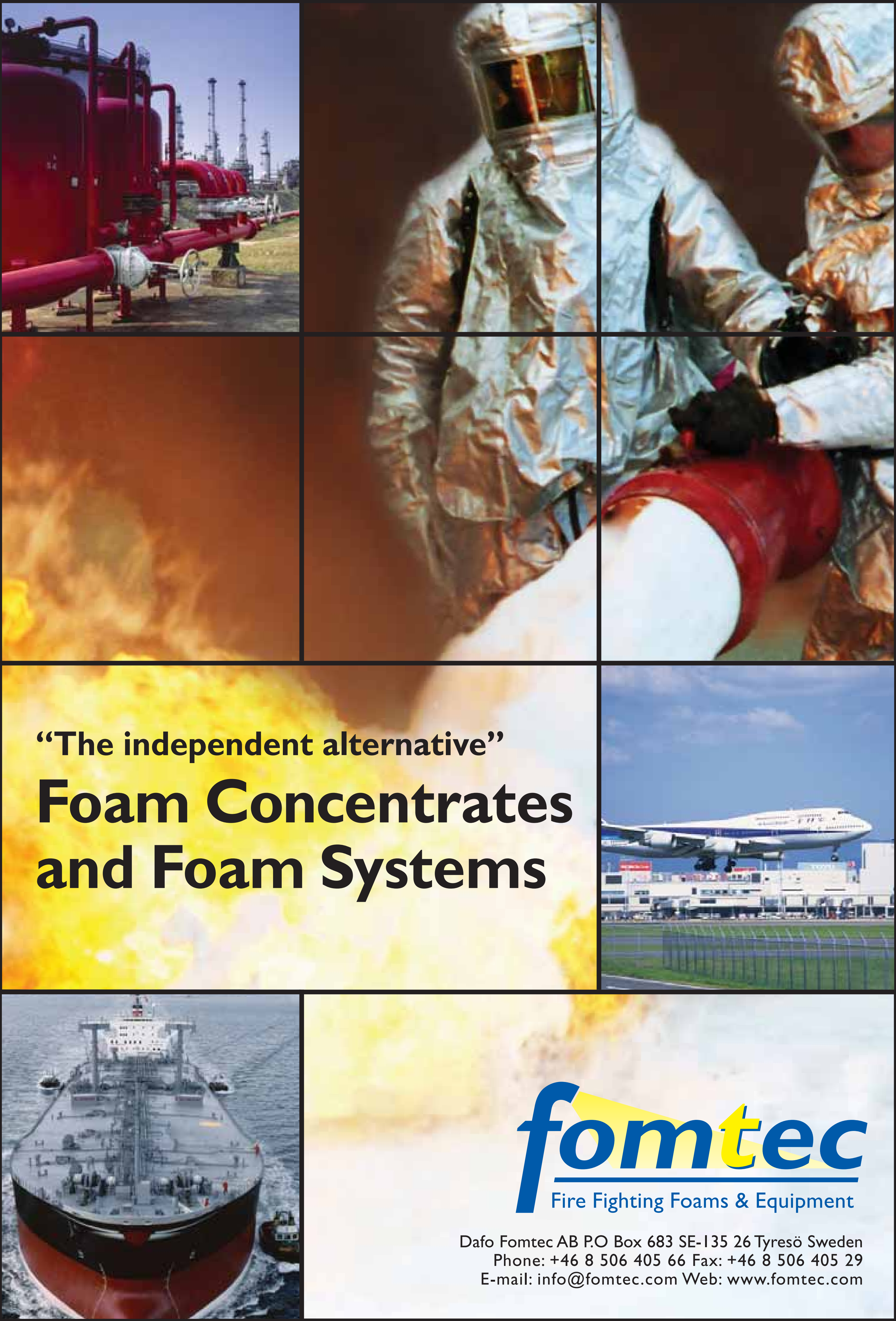

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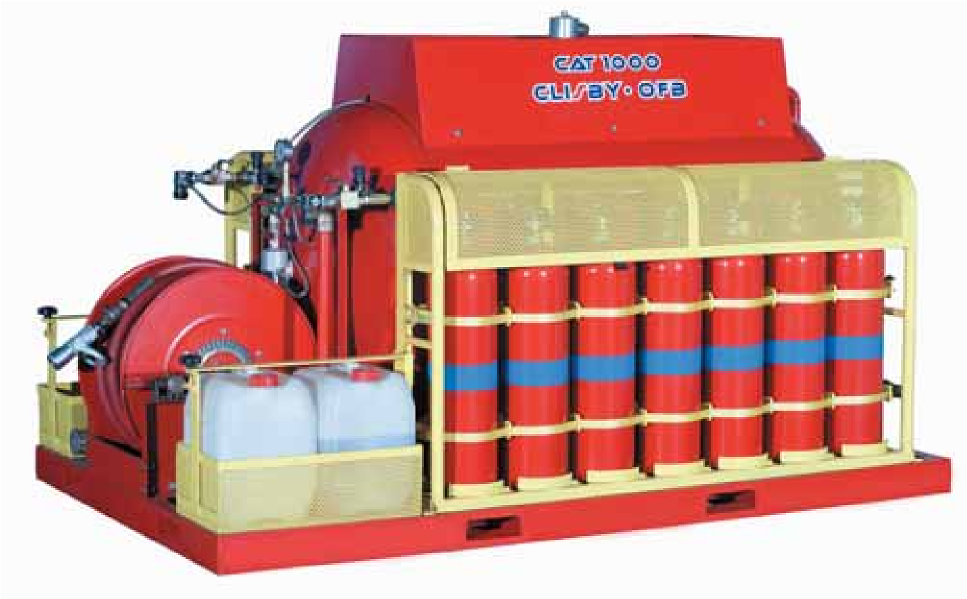

Compressed Air Foam Systems – the Next Chapter

Mike Harvey

OFB Corporation

Injecting compressed air into a solution stream of water and concentrated foam has been a method of fire fighting for over 70 years. The CAFS features most regarded are in its ability to blanket a fire and cause self-extinguishment. However, some would argue that conventional CAFS has its limitations.

The fire industry has long sought a method of extinguishing fires of various heat loads and fuel types, in situations where water may only contain or delay extinguishment. This has been driven by the desire to overcome the pressure from insurance underwriters who have placed a limit on factory and warehouse space utilisation, in some cases prohibiting the use of available storage capacity. Another desire has been to create a firefighting solution that can be scaled to suit any structure or environment.

Conventional CAFS went some way towards resolving these problems. However, there are limitations in terms of the available CAFS applicators and foams and enormous potential for the development of portable and static applicators. Solutions that are self-supporting in terms of energy source, that are available in different sizes to suit the hazard, and that deliver a foam of superior quality and velocity with outstanding knock-down and extinguishing characteristics. Working to resolve these challenges, the engineering team of Clisby OFB has created a solution called CATS (Compressed Air Transfer Systems).

CATS was released to specific markets in 1999, initially concentrating on 150-litre to 400-litres modules, before incorporating the larger and situation-specific designed systems for factories and warehouses. Since then the offering has been further developed into a series of portable, static and mobile units with storage capacities spanning from 100 litres to 10,000 litres. This converts into 3,000 litres to 300,000 litres of blanketing foam at distances of 30 metres and beyond. The system and its foam have been developed and tested in Australia and meet or exceed the standards for the extinguishment of Class A, Class B and Class C fires set by LASTFIRE (Large Atmospheric Storage Tank Fires), and a consortium of international oil companies reviewing the risks associated with fires in storage tanks and developing the best industry practice to mitigate the risks. It also complies fully with Standards Australia's AS 1210-2010 Pressure Vessel code.

Today, Clisby OFB units are available in standard designs or custom-built to suit specific requirements and legislators' demands. Clisby OFB have systems and products in use in the mining, military, aeronautical, logistics, manufacturing and motor sport sectors, as well as with country and metropolitan fire services both within Australia and internationally.

Self-Contained, Non-Toxic Solution

CATS mostly incorporate their own water storage facility; they have no electrical or moving parts save for air-operated solenoids in larger models. They contain their own compressed air storage, where the system pressure over a foam water solution is transferred through a series of engineered orifice and bore networks with regulated and stable flow.

This enables non-toxic, biodegradable foam to be discharged at constant pressure, flow with uniform

small bubble foam developing and maintaining an expansion ratio of 30:1 and greater. It gets to the heat source with velocity (rapid response), thereby penetrating and knocking down the fire plume and blanketing the area. This compares more than favourably with conventional CAFS that often do not develop velocity, are of expansion ratios of 4:1 to 14:1, and are discharged through monitors where the foam is brought into a water stream using a venturi and therefore miss many of the features required for an extinguishing system that are found in the CATS.

The main components are made of high-grade carbon steel – often galvanised – stainless steel and brass, where the primary tank is a pressure vessel designed to AS1210 for the Australian market, and ASME V111 Div 1 Boiler and Pressure Vessel Code for most other countries. The systems have pressure safety valves, pressure gauges, drains, ball valves and pressure regulators. CATS units can be hand manoeuvred, located within a trailer, be truck-mounted or static, and injected into a piped sprinkler network system thereby changing a water system to foam system and changing the effectiveness from containment to extinguishment.

A membrane of varying sized bubbles can be created to suit the fire type with outstanding cohesion properties and long structural integrity, causing fires to self-extinguish and further delivering unprecedented results for nil re-ignition with extended periods of foam structure before drain back. This was confirmed in the Matrix report of a LASTFIRE test.

The consistency of the foam can by adjusted by the concentration levels of the OFB1 foam, the orifice size of the discharge, and the system regulated pressure. However, all models are sold pre-set with instructions for use, therefore no field and static system adjustment is required.

OFB Foam

The main advantages of using the OFB1 foam over a traditional Class A foam is that it provides the flexibility to extinguish both Class B and Class C fires with the same product. However, perhaps more significantly, the foam is non-toxic and biodegradable and can be used on petrochemical, structural and stored items fires. Providing the water used is stable, the pH will be neutral.

The decision to develop this foam was taken on learning from some experts within the market that the foams generally known as AFFF were often toxic and had serious and potentially fatal ramifications for those exposed to them. In place of them, OFB developed its non-toxic foam to replace the potentially cacogenic risk and outperform AFFF in terms of expansion ratio, delivery and effectiveness, not just in Class A fires, but also in class B and Class C fires.

The OFB1 foam was developed along with the original OFB CAF units in 1999, but has since undergone improvement to the point where the company offers its branded foam complete with publicly-available MSDS (Material Safety Data Sheets). MSDS is a high-regarded Australian company based in Canberra that provides specialist products and services to Australian and New Zealand chemical users. The MSDS OFB1 data sheet states that the foam is non-toxic, proven with results from the rigorous and extensive tests conducted to LASTFIRE protocol at the Fiskville Country Fire Authority in Victoria.

Firefighting Application

The CAT system comes into its own where there is limited water supply, as it has its own water storage reservoir enabling, for example a 10,000-litre system to produce 300,000 litres or more of foam. Another key feature is that it will extinguish, whereas a water sprinkler system will likely merely contain or delay the escalation of the fire. Additionally, its non-toxic characteristics mean that post-fire clean-up is more manageable and limited by comparison and avoids post-fire toxic water causing tragic ecological and environmental damage.

Bushfire Firefighting

Often bushfires start from spontaneous combustion involving bush undergrowth, house or building fires or car accidents where the heat load cannot be controlled, thereby escalating. Speed of response is a major factor in stopping a small outbreak becoming a major conflagration The CATS contribution to this objective is its portability, whereby a 1,000-litre unit or one tonne of water can discharge 30,000 litres of high velocity foam or, in the case of a water truck with a traditional tank of say 5,000 litres to 8,000 litres, the same as 30 refills.

Latest Developments

Currently under development is a new range of non-toxic foams that will have the ability to extinguish lithium and magnesium fires with expansion ratios that are three-times higher than the current OFB1 foam. Foams and systems are also being developed that will control and extinguish fires involving exotic fuels used as ordinance in military activities, resulting in a spread of foams from both ends on a fire spectrum, but consistently delivered at constant flow and pressure.

Development is also underway on the design of a skid-mounted 10,000-litre fire truck model with self-generating compressed air storage pods.

The level of fire risk will inevitably expand due to a host of factors, including climate change and the manufacture and distribution of high risk chemicals; at the same time, the public's expectations regarding fire safety and protection of the environment are sure to increase. This will lead to further developments in legislation and compliance requirements, imposing limitations on traditional firefighting systems. New installations will increasingly require proof of purpose and proof of performance prior to approval in a laudable effort to reduce the sad fact that so many lives are lost annually as a result of poor or inadequate fire protection globally. APF

Mike Harvey is CEO of OFB Corporation

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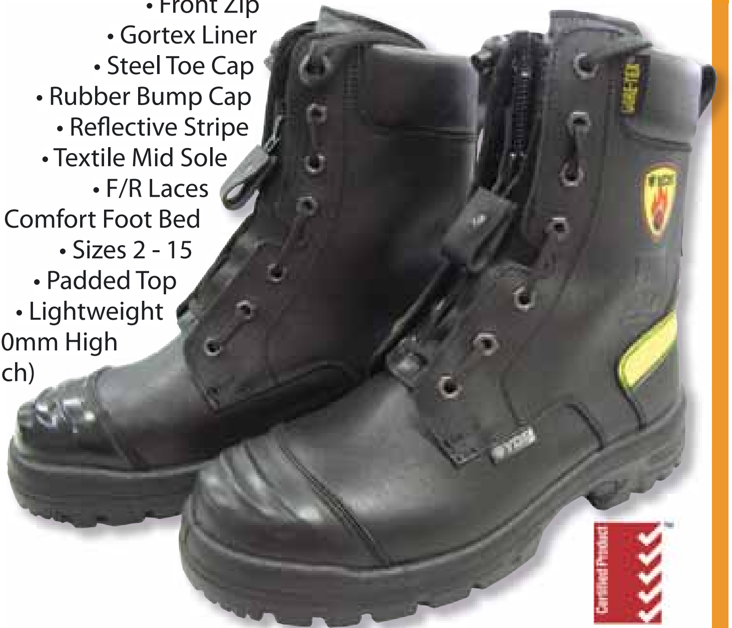

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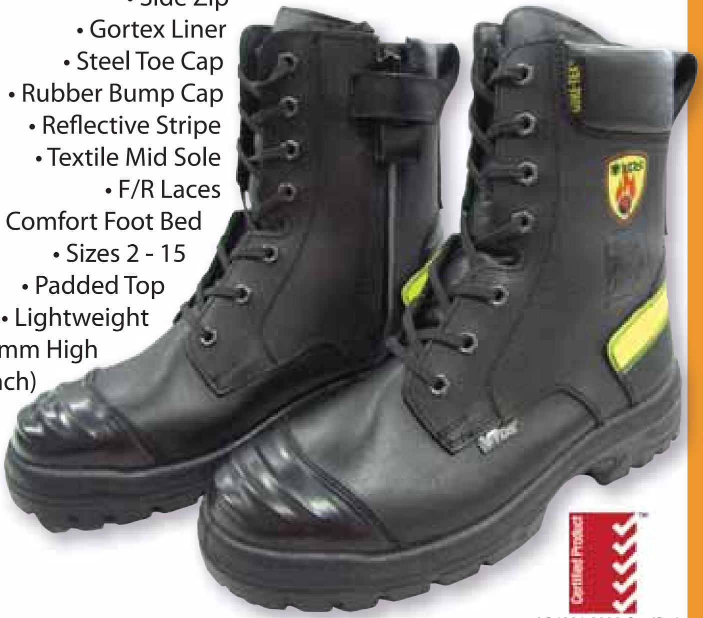

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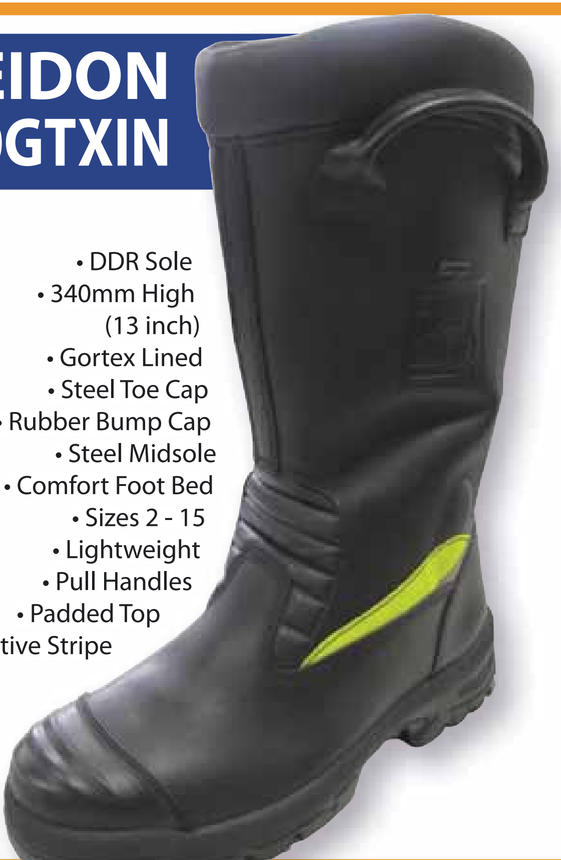

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Addressing the Global Wildfire Challenge

Molly Mowery

NFPA

NFPA expands its reach to address the global wildfire problem.

In recent years, tragic wildfire events around the world have been pushed into the international spotlight. Consider a few headlines from within the past year: "Wildfires turn Russia red: 700 die each day in Moscow as deadly smog doubles mortality rate"; "Bolivia declares emergency over forest fires"; "Israel wildfire death toll tops 40"; "Grassland fire kills 22 in Tibet"; and "Forest fires: Britain bursts into flames." Significant recent wildfire events in countries from Australia to Canada to Greece have further driven home the message that this is an international problem that is not going away. The reasons behind these fires are hotly debated. Mounting evidence of a changing climate, which brings increased drought to different regions, could certainly be playing a role.

Human causes are factors too. Of the more than 700 wildfires that burned in Russia during the summer of 2010, the majority were reportedly started by unintentional human causes: people burning garbage, dropping cigarettes, or failing to properly extinguish campfires or barbecues. Other reasons, such as deliberate burning for agricultural purposes or designating land ownership, can result in similarly devastating wildfires.

Indonesia is an extreme example. In 1997, the combination of slash-and-burn farming practices and arson-caused fires that were set to claim ownership of land resulted in fires that burned out of control for months, scorching more than 20 million acres. The smoke impact of those fires extended to Brunei, Thailand, Vietnam, and the Philippines. In the U.S., human activity is also strongly linked to wildfire. Of the nearly 72,000 wildland fires recorded last year by the National Interagency Fire Centre, nearly 65,000 were listed as human-caused.

Compounding the issues of wildfire risk is the fact that more people worldwide are willingly moving into areas prone to wildfire. In the U.S. and Canada, lifestyle preferences and development patterns have resulted in many new homes being built in suburban and rural environments that are fire-prone, areas known as the wildland-urban interface or WUI. This type of development pattern is shared by many other countries, most notably Australia, where large areas of cities such as Melbourne and Sydney have expanded into the bush. Other types of WUI growth, such as that in South Africa, are a result of informal settlements, as poor populations are pushed to the urban fringe and into the same high wildfire risk areas. Wildland-urban interface environments boast more nature and less city, which also means more trees, grasses, brush, and other fuels that are likely to burn when a wildland fire occurs. It also means

more homes and people, including firefighters, are put at risk during a wildfire event.

Changing weather conditions, settlement patterns, and human behaviour will continue to present challenges in coping with wildfires. NFPA recognizes these challenges and has made a strategic effort to bolster its contribution to wildfire safety on the domestic and international stages. As evidence of the organisation's support, NFPA created a Wildland Fire Operations Division in 2010. My role as a program manager within the division includes coordination of our international outreach. Although this means I am on the road for much of my work, I am learning first-hand the spectrum of WUI threats faced by communities. I also have the benefit of seeing what different countries are doing to address their risk by implementing sound wildland fire safety principles, and sharing lessons

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learned with fire professionals as they embark on the path to creating safer communities.

Fruitful Foundations

Since its creation, the Wildland Fire Operations Division has been actively raising NFPA's profile as an authority on wildland fire mitigation. The division has already initiated studies to look at the effectiveness of regulation in the WUI, and has begun working with other partners, including the U.S. Forest Service, International Association of Fire Chiefs, and the Ad Council, to advance the concept of Fire Adapted Communities, a program that provides information and resources to communities across the U.S. to educate them on wildfire risk and how to work collaboratively to ensure safer living in the WUI.

These efforts are in addition to the on-going implementation of the hugely successful national Firewise program, which encourages local solutions for wildfire safety by involving homeowners, community leaders, firefighters, developers, and others in an effort to protect people and property from the risk of wildfire. The Firewise program teaches residents how to prepare their homes, landscapes, and neighbourhoods to reduce the likelihood of ignition during a wildfire, steps that include clearing brush and debris, cleaning gutters, mowing lawns, and retrofitting windows or replacing vulnerable roofs. More than 700 communities throughout the U.S. have been recognised by the Firewise Communities/USA recognition program.

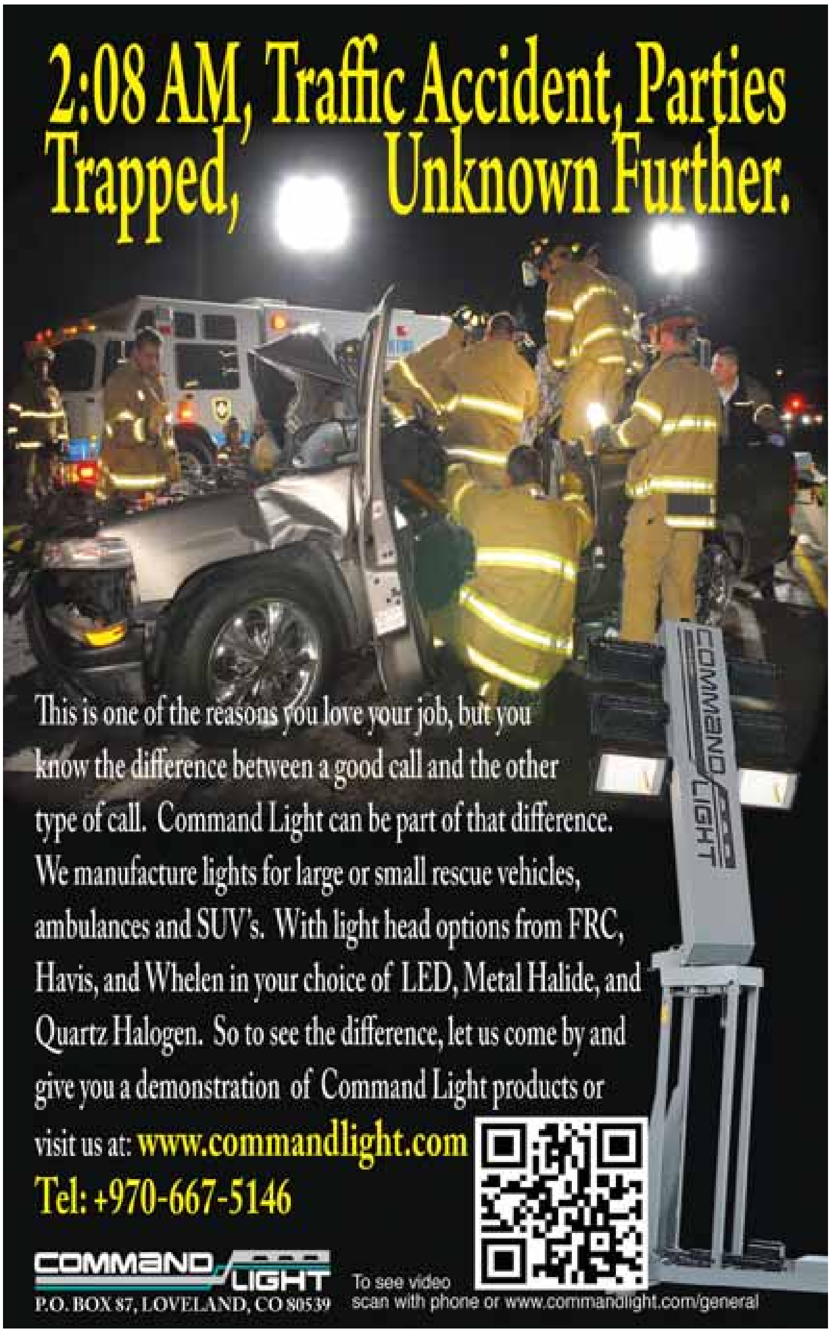
Worldwide, people are willingly moving into areas prone to wildfire. Lifestyle preferences and development patterns have resulted in many new homes being built in suburban and rural environments that are fire-prone.

As the Wildland Fire Operations Division looks forward with new international initiatives, momentum is being drawn from fruitful relationships built over the past decade. During that period, our NFPA staff has travelled to the U.K., Canada and Australia to learn about local efforts to address wildfire hazards and share best practices from the Firewise Communities Program. We have also attended wildland fire conferences aimed at international audiences, and welcomed the participation of delegates from Greece, South Africa, and Australia to NFPA's Backyards & Beyond conferences.

These efforts have enabled partnerships to blossom. A prime example is the work I have been doing with the Canadian non-profit association Partners in Protection (PiP), a network of wildland/urban interface fire professionals from across Canada's provinces. PiP's work includes developing and administering FireSmart, a program that gives communities and homeowners across Canada information and tools to confront wildfire protection issues. Since 2006, PiP has been communicating with NFPA to learn more about our Firewise program and lessons learned that can be applied to FireSmart.

In the last year, Sean Tracey, NFPA's Canadian regional director, and I decided to take the next step: together, we worked with PiP to formalise a relationship between the two associations. A Memorandum of Understanding was signed in February by PiP and NFPA, with the intention of supporting the compatible missions of each organisation to benefit communities throughout North America. Since then, I have been serving on PiP's Board of Directors, fostering on-going communications between our division and its organisation. In 2012, Tracey and I will begin assisting PiP with the development of a FireSmart Communities recognition program for Canada, similar to the Firewise Communities/USA recognition program.

Tracey is equally enthusiastic about the new relationship. He says: "NFPA's support of PiP is an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important collaboration that will allow both organisations to openly share research, best practices, and lessons learned related to wildfire science and mitigation, and the public will benefit from it,". He also notes that NFPA seeks PiP's support to include FireSmart design principles in the forthcoming 2015 edition of the National Building Code of Canada. Standards such as NFPA 1144, Reducing Structural Ignition Hazards from Wildland Fire, could be incorporated and required for application in high-risk areas.

From PiP's perspective, this is a much needed opportunity to elevate professional interest and awareness into wildfire challenges around Canada. "Being affiliated with a world-renowned leader in fire prevention and public safety brings greater recognition and credibility to the Partners in Protection Association," says Kelly O'Shea, the

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executive director for Partners in Protection. "We look forward to working with NFPA to meet the challenges of wildland-urban interface fires."

Future Prospects

In May, I accompanied Michele Steinberg, manager of the Firewise program, on a trip to Sun City, South Africa, for the 5th International Wildland Fire Conference, or "Wildfire 2011." More than 700 delegates from 73 countries met to participate in the conference and discuss the global impact of wildfire. The trip became a pivotal opportunity for us to share the latest NFPA wildland fire program updates and to learn more about the successes and challenges of wildland fire mitigation throughout the world. Most remarkable were the triumphs that South Africa has seen with the implementation of its Firewise efforts, known as Firewise SA.

Initiated through the Working on Fire Programme and funded by the South Africa Government, Firewise SA is an outreach program that creates awareness of wildfire dangers and educates communities about fire prevention. South Africa estimates that more than 90 percent of its forest and savannah fires are human-caused, and the need for outreach is clear. Firewise SA materials and training have been tailored to consider populations with limited access to electricity and fire suppression equipment, as well as the challenge of multiple languages and low literacy rates.

Val Charlton, national advocacy manager of Firewise SA, credits much of the program's success to its ability to access NFPA's Firewise program. "We literally saved millions of dollars by adopting the Firewise USA program and its materials for our own use," Charlton says. "This allowed us to get started on our program quickly and to begin building from a model that we knew already worked successfully."

There is vast potential for these kinds of relationships to continue and to expand all around the world. NFPA is already brainstorming with Firewise SA and PiP to envision a global network of wildfire mitigation professionals, one where we could share information on an international scale and benefit from a global level of support. Nothing like this currently exists, and there is a real opportunity and need for this kind of network.

In the meantime, the Wildland Fire Operations Division is developing a Firewise international package to introduce new global audiences to the Firewise concepts of home protection. This year's Backyards & Beyond wildfire safety and seducation conference in Denver will also feature more international sessions.

As NFPA's role continues to expand in the wildland fire arena, we have plenty of work ahead of us. But through strengthening relationships, sharing information and best practices, and supporting international efforts to address wildfire safety, we also see a world of opportunity. APF

This article appeared originally in NFPA Journal, November/December 2011.

Molly Mowery is Program Manager – Fire Adapted Communities & International Outreach

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Union Carbide: The infamous Union Carbide Plant in Bophal

Mass Decontamination: Why Re-Invent the Wheel?

Hospitals, hazmat teams and fire departments have been trying to develop mass decontamination procedures and specify the equipment required to manage a major chemical, biological or radioactive event. Are these and other agencies wasting valuable time, effort and resources preparing for mass decontamination, considering the United States Army Soldier and Biological Chemical Command (SBCCOM) has developed guidelines for handling mass decontamination of victims?

Dennis K. Sullivan

University of Louisville

Consider three historical events: Bhopal in India; Goiania in Brazil; and Tokyo in Japan.

The Union Carbide Toxic Gas Incident

During the midnight hours of the 2nd December 1984, 40 tons of methyl iso-cyanide and hydrogen cyanide were released from the Union Carbide plant in Bhopal in India creating a deadly gas. The gas spread over an area of 40 square kilometres and hung close to the ground for about four hours. Estimates are that over 500,000 people were exposed to the gases, with 6,000 dying the first week after the release (most died within the first few hours). In the years since the release, over 16,000 people have died from causes that have been directly attributed to the deadly gases. To this date rumours are still circulating that the release was a result of sabotage.

This event provided a rude awakening to emergency services on the importance of preparing for a potential chemical plant accident involving a major chemical release. In the case of Bhopal though, few people received medical attention during the early hours and days of the event. Those who did make it to one of the hospitals in the region were still contaminated by traces of the gas left on their clothing and skin. In addition, no one was evacuated even though warning signs were evident for over an hour prior to the release.

The Goiania Radiation Incident

While dismantling a cancer clinic, workers found a radiotherapy unit that still had a source containing cesium-137. The source was opened and contamination spread throughout the community especially in the homes of the workers. Over 250 people were exposed to the cesium with

Sarin: Kasumigaseki Station, one of the many Tokyo stations affected during the sarin attack

28 people showing signs of radiation sickness and another 104 people having internal contamination.

Since symptoms associated with radiation exposure are slow to develop, they usually become evident hours or days after the exposure, the victims of the radiation exposure were not immediately diagnosed. Once the information about the radioactive material release became common knowledge, the area hospitals were overwhelmed by the number of victims, including those that were truly exposed and those that were not exposed but were scared that they were contaminated (coined "worried well"). As a result of the overflow, a soccer stadium was used to congregate everyone seeking medical attention. In all, 112,800 people were evaluated for radiation contamination or exposure. Only 120 of these people had contamination on their clothing or shoes.

The Tokyo Sarin Incident

During the rush hour on 20th March 1995, terrorist belonging to the Aum Shinrikyo cult released sarin, an organophosphate nerve gas, at several points in the Tokyo subway system. The liquid was hidden in soft drink containers, thermoses and lunch pails and terrorist released it as they left the train. The liquid rapidly vaporised and spread throughout the trains and the train stations. The trains were packed with thousands of commuters and over 5,500 were injured in the attack either directly from the sarin or as a result of the hysteria caused by the sarin.

Initially, Tokyo hospitals were informed by the fire department that they were about to receive a number of victims from a "gas explosion" in the subway. Over 131 ambulances and 1,364 emergency medical personnel were eventually dispatched. At least 641 victims (some were decontaminated others were not) were transported to hospitals by emergency medical and fire department authorities. More than 4,000 people found their own way to area hospitals. The lack of emergency decontamination facilities, poor to non-existent decontamination protocols and insufficient personal protective equipment resulted in secondary exposure of 110 hospital staff and 135 EMT's and Paramedics.

Mass Decontamination

In all three of these events the number of victims was extremely high; higher in fact than what most hospitals and communities consider in their planning process. Hospitals and communities must plan for decontaminating both small numbers of victims and very large numbers. SBCCOM's guidelines indicate that during a terrorist event the community should expect to decontaminate five non-contaminated victims for every one victim that truly requires decontamination.

Once victims arrive at the medical facility, there will be no easy way (unless radioactive materials are involved) to determine who has been contaminated and who is just one of the "worried well". The hospital must be able to decontaminate all of the victims so as to provide for their peace of mind and limit liability to the hospital.

Once a hospital accepts the responsibility of being able to decontaminate a large number of victims, the next issue is to determine the rate that decontamination can be performed and the required resources to sustain that rate. If a hospital has four shower stations and is capable of decontaminating one victim every five minutes per shower station, the hospital's rate of decontamination is 48 victims an hour. In the case of St. Luke's International Hospital in Tokyo, if they could have sustained a rate of 48 victims per hour, they would have had to sustain that rate for 15 hours to decontaminate the 688 victims they received.

There are major drawbacks to decontaminating for 15 hours. First, a victim who has been exposed is not going to wait for 15 hours to be decontaminated and may succumb to the chemical exposure. In addition, people waiting to be decontaminated will be milling around and eventually will become unruly and unrest could manifest itself into mob violence. One thing that is not needed at this juncture is a riot. Contaminated people also run

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the risk of exposing uncontaminated people the longer they remain contaminated. Hospital staff and emergency responders are not equipped, nor are there sufficient numbers to sustain decontamination operations for 15 hours. More rapid decontamination is necessary.

Hospitals also continue to move in the direction of setting up portable decontamination facilities outside of their emergency departments. Setting up these facilities requires additional human resources and time. Even if the hospital begins setting up as the emergency occurs, the set-up time will usually take longer than the first victim to show up at the hospital. If decontamination facilities are not available when the patient arrives at the hospital, the patient is going to find a way to get into the emergency department and get the care he or she thinks they need. Holding a number of patients outside of the emergency department while staff is setting up tents, laying hoses and getting dressed in Level B protective suits will incite the patients who may feel that "If the hospital staff needs protection, what is this stuff doing to me?" This is another opportunity for a mass hysteria or a riot to begin.

Incidents around the world show that the number of victims may be extremely high; higher in fact than what is considered in the planning process. Hospitals and communities must plan for decontaminating both small numbers of victims and very large numbers.

SBCCOM's solution to mass decontamination is to use fire apparatus to form a corridor by parking two fire apparatuses about 4.5 metres apart in opposite directions with the officer's side facing the other unit. High volume nozzles are placed on the discharges. Auxiliary units and minimal staff are required to set up this corridor. Utilisation of front line apparatus and multiple crews is unnecessary. Water pressure to the nozzles and elevated water distribution device should be kept at hydrant pressure, or 60 psi.

If a snozzle, squirt, or deck gun is available on one of the apparatus, it should be used with low pressure to spray water from its elevated position. These trucks can be set up in less than ten minutes and already have the crews in place to provide assistance. The biggest problem associated with this set-up is the time needed for the units to respond from their station to either the scene or the hospital. The benefit is that this does not take any special apparatus or crew, only the typical engine company found at your neighbourhood firehouse.

Once the victims have been directed towards the corridor, they will be instructed to disrobe near the front of the fire apparatus. The victims will be told to put their clothes into garbage bags and write their names on the bags. Once unclothed, the victims will be directed to walk slowly through the corridor being sprayed from every direction. They will be instructed to raise their arms and spread their legs and to try to get every body-surface flushed by the flowing water. When they have reached the middle of the corridor, they will be instructed to turn around to ensure that the water flow has had a chance to rinse every body-surface; gentle rubbing would be encouraged at this point.

After moving through the corridor, the victims should be provided paper gowns or tyvek paper suits to provide modesty and some protection from the elements. Then the patients will be evaluated to determine if additional evaluation or medical treatment is necessary.

The SBCOOM Method

The SBCOOM method would remove the most contamination from the most victims in the shortest period of time while utilising the least amount of resources. While it will not get every victim 100 percent decontaminated (neither does the traditional methods), it would make most victims clean enough for hospital staff to evaluate them more thoroughly. If a second decontamination is necessary, the more traditional decontamination methods can be employed.

The information and guidelines provided by SBCCOM are available because Nunn-Lugar funds were set aside for the federal government to enhance the capabilities of local responders to a terrorist threat. SBCCOM was assigned the mission of developing an Improved Response Program (IRP) for emergency responders. Under this program, SBCCOM studied and then recommended emergency management guidelines for actions to be taken in response to a terrorist attack.

A number of major cities including Washington, D.C., Philadelphia, Houston and Virginia Beach have accepted these recommendations and have made them part of their Weapons of Mass Destruction (WMD) decontamination strategy. Other communities need to consider their strategy in light of the SBCCOM guidance. Wasting valuable resources (in times of budget deficits) on tent systems, portable showers and personnel expenditures seems somewhat foolish when the SBCCOM system is an acceptable option.

These guidelines are available on the web in PDF format: Guidelines for Mass Casualty Decontamination During a Terrorist Chemical Agent Incident, at http://www.au.af.mil/au/awc/awcgate/army/sbccom_decon.pdf; *Guidelines for Cold Weather Mass Casualty Decontamination During a Terrorist Chemical Agent Incident at* http://www.ecbc.army.mil/downloads/cwirp/ECBC_cwirp_cold_weather_mass_decon.pdf; and Mass Contaminated Fatalities During a Terrorist Chemical Agent Incident at http://www.ecbc.army.mil/hld/dl/MFM_Capstone_August_2005.pdf. **APF**

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Alarm Cable – Gett

Robert Kaslik

FireSense

Wiring products and their installation that interconnect fire alarm system components is one of the most important, yet most frequently overlooked, parts of the entire fire system integrity.

Too often we see the latest technology equipment installed in a project with insufficient attention given to the wiring system that interconnects these components. This can seriously jeopardise the effectiveness of the entire system in a true fire situation.

Australian Standards mandate the use of two-hour fire rate cables in many aspects of the fire alarm system, particularly in relation to mechanical control systems and building evacuation systems. The governing standard for these cables is AS/NZS 3013: 2005 (Electrical installations – Classification of the fire and mechanical performance of wiring system elements) which will be covered in greater detail later in this article.

One important point to note is that the Australian Standards should be used as a minimum standard for the installation to achieve certification of the building during construction. These standards are not designed to take into account longevity of the installation, environmental impact of the installation or the effectiveness of the system performance in a fire alarm system over and above the base system requirements.

Careful consideration should be given to how the building is going to be evacuated and controlled in a fire and an assessment needs to be made of critical points of potential weakness in the wiring system used. For example, in a typical basic commercial environment that does not involve AS1668:2005 fan controls (The use of Ventilation and Air-Conditioning in Buildings), AS1670:2004 (Fire detection, warning, control and intercom systems – System design, installation and commissioning – Fire) does not require standard point type smoke detectors to be wired in fire-rated cable; a simple red TPS (Thermo Plastic Sheathed) PVC insulated cable will suffice. The intent of the standard is to simply register the first alarm, initiate evacuation and call the fire brigade. As pointed out earlier, this is a minimum requirement.

Unfortunately with this minimum requirement, as the fire spreads throughout the building, the integrity of the wiring system cannot be guaranteed and important additional information relating to the spread of the fire and smoke may not be relayed to the firefighters in the fire control room. If the entire wiring system was fire-rated in accordance with AS/NZS3013, this additional information would definitely be available to the firefighters in the fire control room.

In previous years there was a reluctance to use fire-rated cable in all aspects of the fire alarm system and it was impractical due to nature of the product and the fact that it came at a considerable additional expense. The technology involved in the manufacture of polyester resins and cross-linked polymers has come a long way in the past decade and now provides us with a range of new high-technology materials that make the widespread use of fire-rated cables far more economical and practical than in earlier years.

The cross-linked polymer materials and mica insulation used in modern cables allow for simple installation by an electrician as with any other standard PVC cable. The cables are extremely flexible, easy to strip and terminate and require little to no additional installation time.

It is also important to note that to achieve an effective fire-rated installation to AS/NZS 3013, not only does the cable itself need to be approved, but also the installation and in particular the fixing of the cable needs to be in accordance with the manufacturer's guidelines. For example, there is no point

ing it Right

WS	5	2	W

The First numeral indicates the wiring system's ability to maintain circuit integrity during a fire condition.

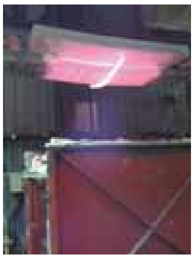
1	15 minutes
2	30 minutes
3	60 minutes
4	90 minutes
5	120 minutes

The Second numeral indicates the wiring system's degree of mechanical protection due to cutting and impact load.

	Impact Test (J)	Cutting Test (kN)	Level of Protection
1	2.5	0.3	Light
2	15	1.0	Moderate
3	50	5.0	Heavy
4	500	5.0	Very Heavy
5	5000	5.0	Extremely Heavy

The 'W' suffix denotes the wiring system's capability to maintaining circuit integrity when subjected to water spray immediately following a fire condition.

Cables are subjected to fire at 1050°C for 120 minutes, then water sprayed for a further 3 minutes.



using a fire-rated cable if it is affixed to a cable tray with plastic cable ties. Plastic cable ties will melt during a fire causing the cable installation to lose integrity. It is important that steel cable ties are used at appropriate intervals as nominated by the manufacturer, and the cable is attached to the cable tray. In turn, the tray and its supports must also be approved and certified for the desired fire rating. In summary, it is important that all of the components used, and the way in which the cable wiring is installed and secured, satisfies the desired fire rating.

Modern fire-rated cables are almost always made from low smoke, low toxicity, zero halogen materials (often abbreviated as LSOH or LSZH). This means that in a real fire, not only does the cable itself withstand the fire and continue to operate, the cable also does not emit dangerous levels of smoke or toxins in the way a PVC insulated cable would in a fire. This makes the cable ideally suited for underground or enclosed areas.

LSOH and LSZH cables are also manufactured without the use of ozone-depleting halogens, which provides an environmentally friendly solution for the installation. The use of fire-rated cables provides immediate PVC minimisation credits for the installation under the Green Building scheme.

Understanding AS/NZS3013

When installation standards refer at AS/NZS3013 they also advise a minimum rating, such as WS52W. This rating system identifies the sub-classifications within AS/NZS 3013 and therefore the "fire rating" for which the component is rated.

The classification system prefix is 'WS' followed by two numerals and a supplementary letter W (see above).

It is important to ensure that the minimum rating is achieved.

Generally, all Australian fire alarm system standards call for a minimum two-hour fire rating. The variance between standards tends to come more with the minimum mechanical rating that is required. For example AS1670.1 calls for a minimum rating of WS51W whereas AS1668 calls for a minimum rating of WS52W. Both of these standards have the same minimum "fire" rating but AS1668 calls for higher minimum level of mechanical protection. It is also important to remember that a WS52W can always be used in place of a WS51W cable but not vice versa.

Approvals

International Standards, British Standards and UL Standard cables are not interchangeable with Australia Standard AS/NZS3013. It is of critical importance that any fire-rated fire alarm cables used in Australian Standard projects are specifically tested and approved to AS/NZS3013. These tests are done for both fire and mechanical properties and should be independently certified by an accredited third-party testing laboratory. All cable manufacturers should be able to provide copies of certificates verifying third-party accreditation of their products to AS/NZS 3013 for both fire and mechanical testing.

The Australian Government's CSIRO (Commonwealth Scientific and Industrial Research Organisation) runs an ActivFire listing program (www.activfire.gov.au) that lists all fire alarm equipment approved for use in Australia. It also lists fire-rated cables that have been independently certified by third-party testing laboratories and are registered for use in Australian fire alarm systems. APF

Robert Kaslik is General Manager at FireSense

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Pbi PERFORMANCE PRODUCTS, INC.

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